SEP 30 1935

ELECTRICAL WORLD

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Sodium Street Lights Reduce Traffic Accidents

SEPTEMBER 28
1935

Selling Light in Philadelphia

That Lost Lighting Load

An Experience in Home Lighting

Highway Lighting Face to Face

High-Voltage Bushings Tested

How Utilities Sell Ranges

WESTON *Electrical Tachometers*

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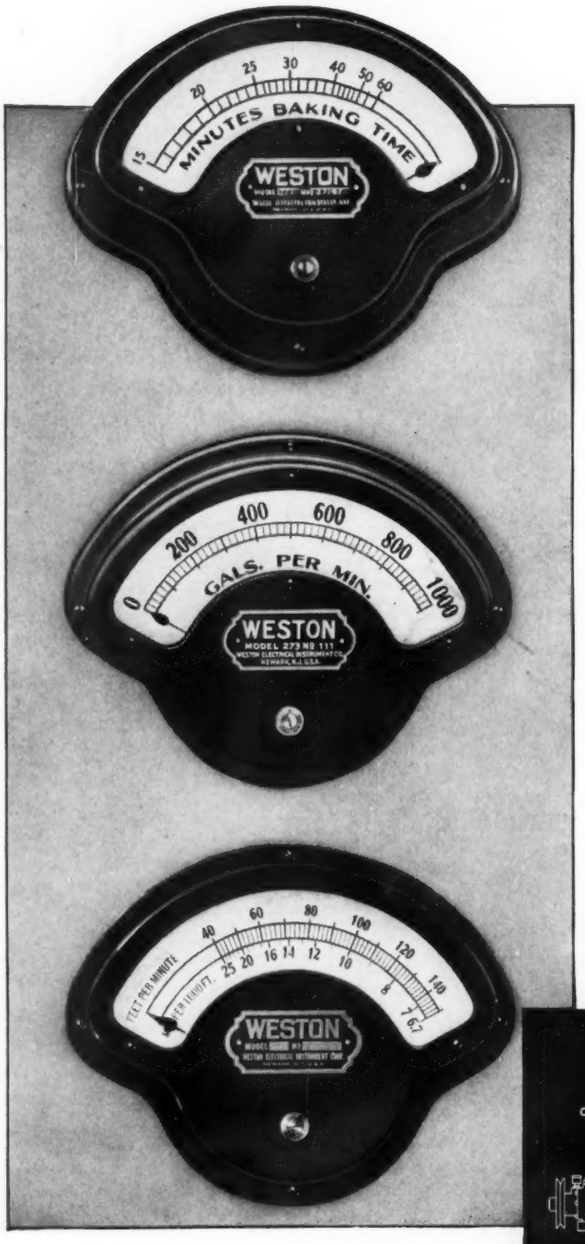

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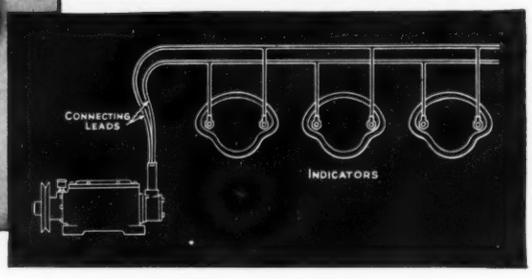

With Weston Electrical Tachometers one or more indicators can be operated by the single magneto, and placed wherever desired.

WESTON *Instruments*

ELECTRICAL WORLD

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR SIXTY YEARS

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Reader's Guide to This Issue

This index is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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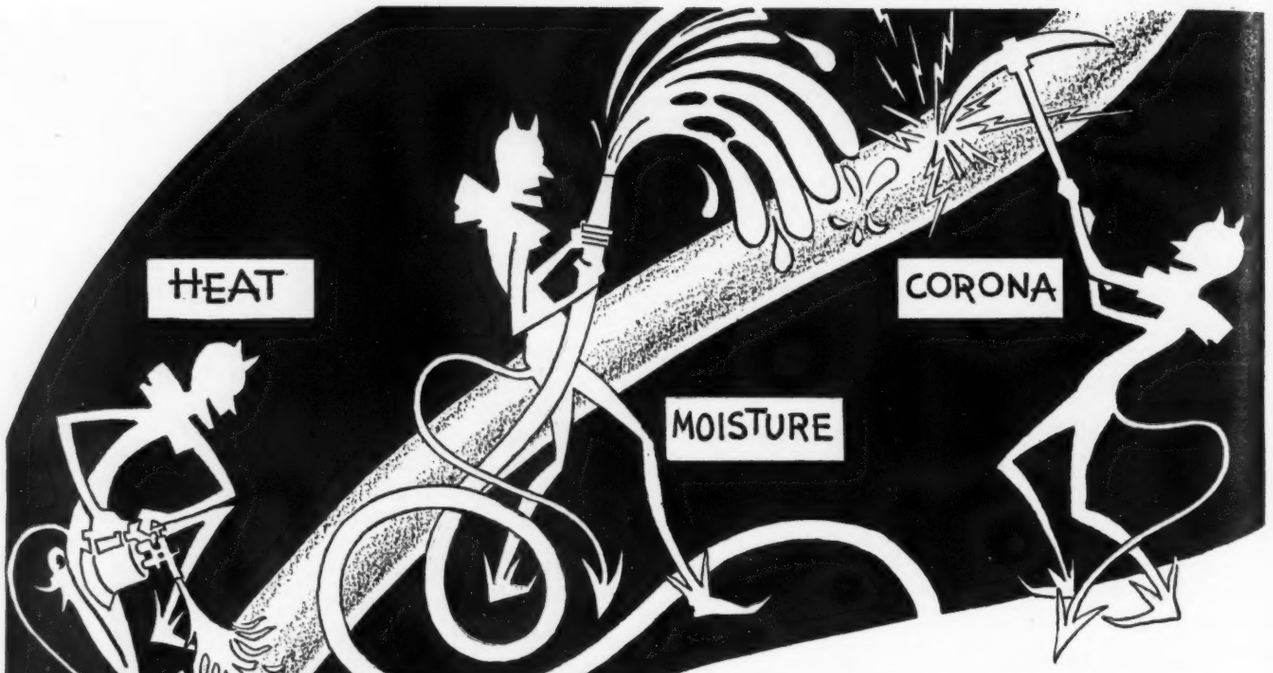

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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

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SEPTEMBER 28, 1935

Customer Service— A New Management Problem

A FRANK stock-taking of how utility customers are served suggests ideas for radical changes in the fundamental organization of utilities. It is not sufficient to give continuous service at reasonable rates. This is taken for granted. To this must be added the friendly service and helpful counsel that are the stock in trade of any successful merchant. Yet, in large measure, the relations between the customers and the utilities that serve them have become routinized and systematized to an impersonal accounting or sales basis. There are too many contacts with each customer. There is too much business and too little intimacy in the relationship.

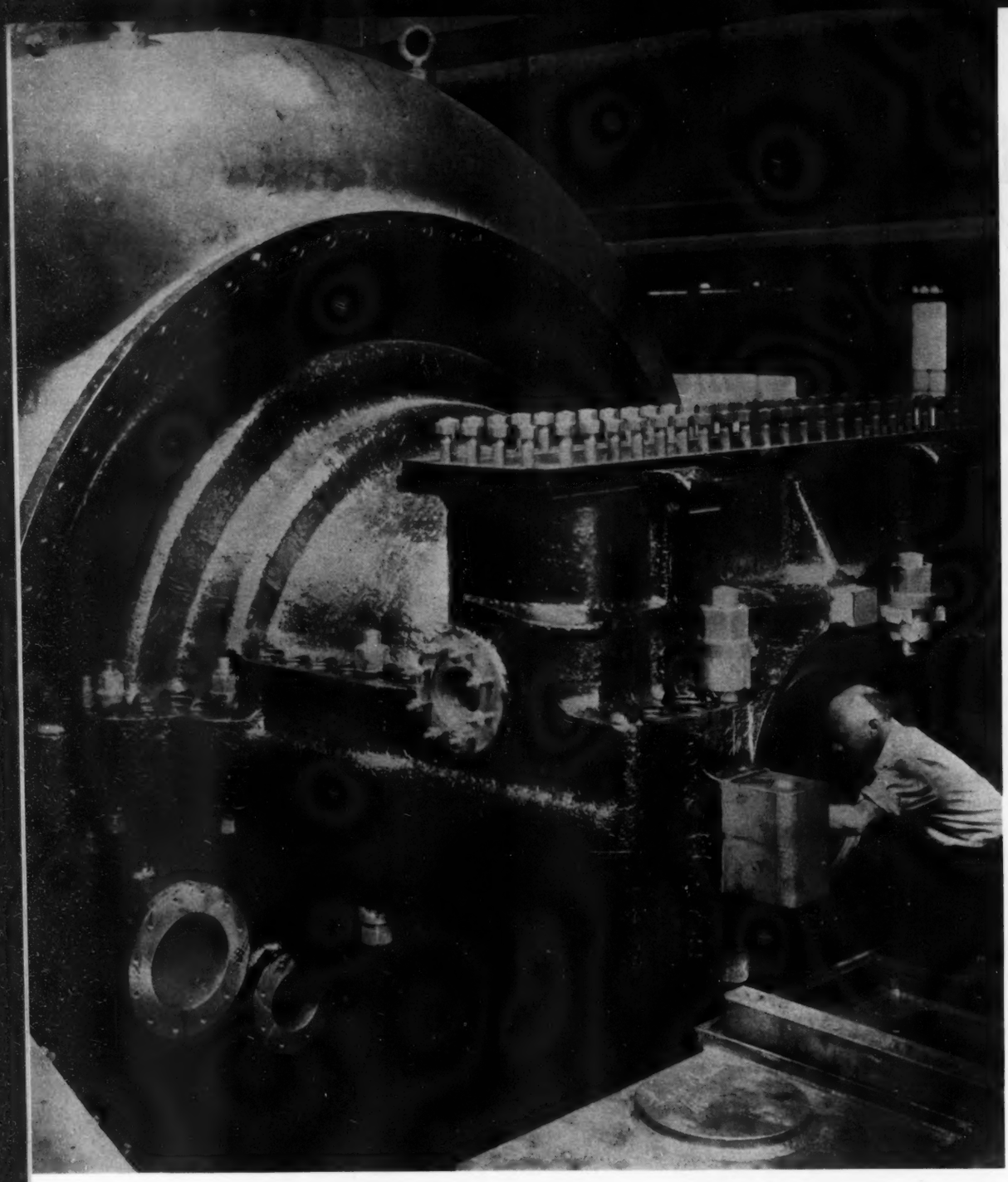
The typical customer knows his utility through the bills received, the checks he mails, the meter reader, the bill collector, the appliance salesman, the service man, the power salesman, the cashier, the telephone operator and the complaint clerk. He doesn't know his local utility as an intimate friend.

TRULY to serve the customer, the ideal is a utility that is personalized in a friendly and competent electrical consultant who approaches his duties from the point of view of the customer and carries out personally all relations between the utility and the customer. A customer of a department store thinks of Mary Jones, the particular clerk she knows who takes care of her needs and gives her service. Mary Jones is a friend who personalizes the store and its service to the group of customers she serves. How can all the present impersonal and multiple contacts in the utility business be individualized and consolidated? How can the present organization functions be changed to bring about a more ideal business relation? This is the problem of management today.

Of course utility executives and their employees have the interests of their customers in mind and strive to do everything possible to improve customer relations. But they are handicapped in their efforts because the functional organization and the business practices built up over the years have been developed too much from the point of view of efficient and economical internal departmental functioning. The typical utility organization introduces obstacles to carrying out the present needs of management and does not meet the specifications of service from the viewpoint of the customer to best advantage.

HOW to change an organization to meet the present needs is not readily apparent, but several examples are available that point in the right direction. The home service personnel, the district representatives, the power sales service men and the Better Sight-Better Light sales approach are imperfect but helpful steps to solve the major management problem. But the decentralization and consolidation must go much farther to be most effective. If possible, one individual should be assigned to each group of from 100 to 1,000 customers to perform all the necessary business functions of the utility, to become a friend of each of his customers, to personalize the company to each of his customers and to render all the tangible and intangible services that make customers like him and his company. The organization should be revamped to resemble that used by a good merchant.

All utilities will do well to study this fundamental opportunity to build prosperity for the industry upon the solid ground of public favor, and fortunately this management problem is intimately associated with the problem of increasing business. Both service and sales may be brought into play so that any increased costs necessitated by changes in the present functional organization and methods of handling the business can be offset in part or entirely by the sales and sales promotion advantages that should accrue from endeavors to arrive at improved customer relations. This program is the basis of a league for improved customer relations now needed in the industry.



DETROIT MODERNIZES STEAM PLANT

Three of Detroit Edison Company's older 20,000-kw. steam turbines have been rebuilt and modernized to operate at 600 lb. pressure and their capacities increased to 30,000 kw. each. The third and last unit is shown on the floor of the General Electric turbine shop at Schenectady, just before being taken down for shipment to the Conners Creek station of the Detroit Edison Company. The exhaust hood shown at the left was part of the original 20,000-kw. unit; the parts in the foreground have been added in the modernization program.

Selling Light in Philadelphia

The Story of a Highly Organized Better Light-Better Sight Campaign in a Metropolitan City and What It Accomplished

By G. BERTRAM REGAR
Manager Lighting Sales Department, Philadelphia Electric Company

THE Philadelphia Electric Company, for years active in the promotion of better lighting, along with other utility companies, faced the loss of lighting revenue in the year 1933. In the industrial field the slowing down of production made the use of many lighting outlets unnecessary. Because of unemployment, sales of commodities were at a low ebb and merchants cut down on lighting. In the street lighting, municipalities, faced with reduced income due to nonpayment of taxes, reduced not only the size of lamps, but turned off many, hoping to balance their budgets. Electric sign lighting suffered a slump either in non-use or the replacement of lamps with those of smaller sizes. Many similar practices of economy were put into effect in the homes.

Despite this condition, the constructive policy of promoting a lighting consciousness was so firmly established by our company that the expenditure of money for additional promotional lighting work and for increased personnel was approved. The lighting sales department was increased and has continued to grow until today we have 82 men and women engaged in this work. This entire force is used in the promotion of better lighting, in co-operation with architects, consulting engineers, electrical contractors and lighting equipment salesmen. We do not sell lighting equipment.

With the inception of the national Better Light-Better Sight activity the "Better-Sight Council of Philadelphia and Vicinity" was organized. The governing body consisted of prominent executives of the electrical interests, the eyesight specialists, the paint industry and welfare and civic organizations. The council concerned itself solely with promoting public acceptance of the importance of conserving vision through the proper care of the eyes, proper lighting and the use of proper color surroundings. Since its inauguration, on October 1, 1934, the following work has been done:

1. "Save Eyes" advertised on 110 full-sized billboards.
2. "Save Eyes" display cards in 4,000 windows of electrical dealers, stores selling paints, department and house-furnishing stores, and in windows and offices of eyesight specialists.
3. "Save Eyes" banners on 1,000 trucks of electrical dealers and paint dealers.
4. 156 radio broadcasts made.
5. Twenty-four meetings with a total attendance of 2,811, held with groups affiliated with this activity.
6. Fifty-two talks given before business men's civic, welfare, church, parent-teachers, women's and homemakers' organizations, with a total attendance of 21,772 people.
7. Newspaper advertising and news item publicity.
8. Window displays.
9. Featuring of Better Light-Better Sight at the 1934 Philadelphia Electric and Radio Show, which had an attendance of 120,000 people.
10. An exhibit, with demonstrators in charge, portraying the advantages of proper lighting as a means of conserving eyesight at Philadelphia's eighth annual Educational Week for the Blind.
11. Distribution of the "Save Eyes" booklet to 100,000 children.

A "Sight-Savers League" was formed and for a period of ten weeks the importance of conserving eyesight was broadcast over the radio twice daily and children were told to ask for a Sight-Savers booklet and a Sight-Savers button from any dealer or eyesight specialist displaying the league emblem. With the booklet there was inclosed a questionnaire on the subject of how to save eyesight, and each week a study lamp was awarded to the child sending in the best answers to the questions received during that particular week. While the appeal was made directly to children, the many requests from school authorities and teachers for booklets to be given by them to the pupils demonstrated their value.

Meanwhile, the eyesight specialists stressed the importance of eye care through eye examination and the use of glasses where found to be necessary. The lighting interests promoted the importance of the relationship of proper lighting to better seeing. The paint industry told how the use of proper color surroundings aided better lighting. Each of these groups, working either as a unit or through individual effort, promoted the advantages which their services rendered in the conservation of eyesight.

One of the activities of the Electrical Association provided for a distributor salesmen's campaign in which cash prizes were awarded for the greatest accomplishment for the sale of new and additional lighting equipment. It met with such marked success that it will again be repeated in the winter months of 1935-36. The demonstration personnel of the lighting exhibit located at the association's headquarters was increased and an intensive promotion was instituted to increase attendance on the part of the public. From October 1, 1934, to date 29,741 people have visited the lighting exhibit.

Our own lighting specialists, under the auspices of the Better-Sight Council, have constantly addressed meetings of the public and talked over the radio on the subject of "Save Eyesight." The women home-lighting specialists have given courses of lighting instruction to the sales employees of the lamp departments of the larger department and house-furnishing stores and from

Staff of women who call on the homes of Philadelphia to demonstrate better lighting and promote eyesight conservation

time to time are on duty at the stores, assisting the personnel in the sale of portable lamps to their customers. This has resulted not only in increased number of sales of portable lamps, but in the selling of better merchandise.

The company has made window displays, portraying Better Light-Better Sight in many of its 31 stores and has made three distributions of publicity matter on the subject to its 533,000 domestic customers. Mail broadsides have likewise been prepared applying to specific classifications of business, such as industrial, office buildings, hotels, stores and outdoor enterprises and sent to these classes of customers at the proper season of the year.

In every case the services of a lighting specialist are offered to render assistance in the customer's lighting problems. During the period from October 1, 1934, to June 1, 1935, 78,200 calls on customers were made by the lighting salesmen and the women home-lighting specialists.

The results in improved business evidence the wisdom of these lighting promotional activities: *The increased percentage of domestic kilowatt-hour sales of 1933 over 1932 was only 2.8, but of 1934 over 1933 it amounted to 6.7. In commercial lighting the kilowatt-hour sales for 1933 showed a loss of 1.9 per cent over 1932 and an increase for 1934 over 1933 of 6.2 per cent. We estimate that this department, doing nothing but promotional work, added $750,000 to our annual revenue last year. From present indications the percentage increases in both classifications for 1935 over 1934 will at least equal, if not surpass, those of 1934 over 1933.*

It cannot be construed that the lighting sales department is wholly responsible for this growth. Even with its large personnel, it has contacted only a small percentage of our customers. It must likewise be remembered that other agencies are promoting better lighting. Also, the company has been continuing its policy of active appliance promotion and sale among both residence and retail customers. Nevertheless, the large additional load being added to our lines by the lighting sales department has warranted its approval by our executives.

In the commercial lighting sales activity the department added to our lines 14 per cent more load in 1934 than in 1933. The average per man was 377 kw., or the equivalent of $21,750 of estimated annual revenue.

The broadest field for development, however, is with our 533,000 domestic customers, and while the surface has only been scratched, an ever-increasing progress is being made. In the year 1933, with 55 girl-months, the development of home lighting added to our lines 341.3 kw., or an average of 6.2 kw. per girl-month. On the basis of a girl-year, this is equivalent to 74.4 kw., or an estimated annual revenue of $2,232. In 1934, with the expansion of this activity in the latter part of the year, involving, as it did, training and losses previously mentioned, with 137 girl-months, we added to our lines 802.8 kw., or an average of 5.9 kw. per girl-month. On the basis of a girl-year, this is equivalent to 70.8 kw., or an estimated annual revenue of $2,124.

In the first five months of the present year, with 68 girl-months, we added to our lines 552.4 kw., or an average of 8.1 kw. per girl-month. On the basis of a girl-year, this is equivalent to 97.2 kw., or an estimated annual revenue of $2,916. As an indication of the results which are being accomplished through better trained and established personnel, in the present year, with those girls longest in service, 29 girl-months produced an average of 10.8 kw. per girl-month, as compared to 39 girl-months involving the newer girls of 6.1 kw.

With the coming of fall it is proposed to enlarge the home-lighting specialist force. On the basis of present girl-months production, with little added expense for overhead, the cost for producing a dollar of revenue would naturally be reduced.

Analysis of cost per dollar of annual revenue have been made by various electric utility companies. It is obvious that these are affected by what is included, some companies including only salesmen's salaries and traveling expenses. In computing our costs, sales salaries, traveling and incidental expenses, rental, light, telephone service, stationery, clerical and supervisory cost of the section engaged in the work, as well as a proportion of departmental overhead, are taken into consideration. *In the present year to date the cost per dollar of estimated annual revenue of commercial lighting amounts to 16 cents, and for domestic lighting, 86 cents.*

Great possibilities are seen ahead in the rebuilding of commercial and industrial lighting load in the process of modernizing production processes and working conditions to meet the new conditions that will be met as business volume swells. One striking example that we have just handled was one of our largest manufacturers who has improved the lighting of his plant. The present lighting load of this customer is 300 kw., and the plans submitted, which have been accepted, call for a lighting load of 1,200 kw., or an increase of 900 kw. over the present lighting load. It is estimated that the rewiring and relighting will cost the customer $46,000, and through our promotional work this piece of business is being passed on to the electrical contractor, the manufacturers of the lighting and wiring equipment.

Although business depression is still a vital factor in contacting our customers, both commercial and domestic, in the interest of better lighting, we find less and less resistance to our presentation of the advantages of better lighting. We can only assume that such is the case because of the educational worth of the Better Light-Better Sight activity, and we are cooperating to the fullest extent.

That Lost Lighting Load

Ten Kilowatt-Hours Were Dropped From Every Lighting Bill During the Period When Light Was Neglected for Appliances—What It Is Worth

By
ARTHUR HUNTINGTON
Iowa Electric Light & Power Company, Cedar Rapids, Iowa.

IN 1910 the average lighting bill throughout the country was about 30 kw.-hr. a month and the average lamp was a free renewal 56-watt, 16-cp. carbon lamp. The average rate was about 10 cents per kilowatt-hour. The industry was just launching into the power business. With the advent of the more efficient lamps, the flat iron, the washing machine and similar current-consuming devices it was assumed that a reduction in rates would greatly stimulate the use of electricity. So the power companies went aggressively into the power business, letting the lighting end of the industry drift.

As aggressive selling had always been the major factor in the growth of residential lighting, the transferring of sales effort to the development of power load was followed by a sharp decline in both the lighting standards and the kilowatt-hours per average bill. Almost overnight the size of the lamp in use dropped to less than 50 watts, and it was soon learned that the income from many devices was much below expectations, the net result being that in two years the average bill dropped to about 23 kw.-hr. and the average rate became about 9 cents.

By 1915 the current consumption reached bottom at 21.6 kw.-hr., but the corresponding 8-cent average rate for that period was not bottom. It was 1923 before the average bill called for more current than the 1910 average. In that year the average use was 30.6 kw.-hr. per bill and the average rate was 7.3 cents.

Stating it more concisely, it took thirteen years' growth of both the lighting and device business and a reduction of 27 per cent in the rate to get past the 30-kw.-hr. average residence bill of 1910. The old house wire activities of 1916 to 1920 did much to bolster up the gross residence income, but it did nothing toward picking up the 10 kw.-hr. per bill which was lost approximately a decade before.

Not until after the war was sales effort again directed toward the building of residential load, and then it was appliances which received the major attention. As for rates, the industry continues under some spell and is yet suffering from that hysteria, which is now considered the private property of "Norris, Ickes, T.V.A. & Company." They continue to believe that large use of service is the result of low rates, when, as a matter of fact, a low rate which is justified on account of a low cost comes only with a large use, and a large use comes only with sales effort.

The point I am making here is that

Analysis of Customer Average Use on the Iowa Electric Light & Power System Sent Out With August, 1934, Monthly Reports

	Kw.-Hr. per Year Residence Use			Inc. or *Dec.*	No. of Bills Rendered per Month			Customers Lost Based on 1931		Kw.-Hr. per Bill		Kw.-Hr. Inc. or *Dec*	Increase or *Decrease* Kw.-Hr. 1931 vs 1934		Net Gain or *Loss*	Kw.-Hr. per Bill
	Aver. Month 1931	Aver. Eight Months 1934	Month August 1934	1931 1934	Year 1931	Eight Months 1934	August 1934	Aver. Eight Months	August 1934	Year 1931	Eight Months 1934	per Bill 1931 vs. 1934	Customers Now On Lines	Customers Cut Off Used in 1931	1931 vs. 1934	Of Cut-off Consumers in 1934
Boone.....	116,901	121,606	110,311	4,705	3,734	3,572	3,563	*162*	*171*	31.30	34.04	2.73	9,754	*5,049*	4,705	31.16
Cedar-Rapids.	708,523	686,41[illegible]	634,114	*22,107*	15,724	15,408	15,557	*316*	*167*	45.05	44.57	*0.48*	*7,395*	*14,712*	*22,107*	46.55
Jefferson(a)...	67,716	63,800	62,205	*3,916*	1,454	1,331	1,297	*123*	*157*	46.57	47.93	1.36	1,810	*5,726*	*3,916*	46.56
Marion.....	79,092	75,250	73,981	*3,842*	2,296	2,070	2,115	*226*	*181*	35.79	36.35	1.56	3,929	*7,771*	*3,842*	31.28
Marshalltown.	202,235	197,952	185,440	*4,283*	5,597	5,318	5,391	*279*	*206*	36.13	37.22	1.09	5,796	*10,079*	*4,283*	36.12
Mt. Vernon(b)	41,168	36,512	36,536	*4,656*	1,131	1,060	1,069	*71*	*62*	36.39	34.44	*1.95*	*2,067*	*2,589*	*4,656*	36.39
Nevada.....	45,356	41,628	43,990	*3,728*	1,270	1,167	1,178	*103*	*92*	35.71	35.67	*0.04*	*47*	*3,681*	*3,728*	35.75
Perry.....	99,507	101,854	104,097	2,347	2,591	2,481	2,493	*110*	*98*	38.40	41.05	2.65	6,574	*4,227*	2,347	38.42
Toledo.....	155,886	138,724	147,268	*17,162*	3,921	3,682	3,693	*289*	*278*	39.25	37.67	*1.58*	*5,818*	*11,344*	*17,162*	39.25
	1,516,384	146,347	1,397,942	*59,694*	37,718	36,089	36,356	*1,679*	*1,412*				12,536	*65,178*	*52,642*	
				7,052									27,863			
				52,642									*15,327*			
													12,536			

Slide rule calculations

if this forgotten 10 kw.-hr. per bill of light could be picked up now—and it looks as though it will be—it would be a great boom to the electric business. It will make a large group of unprofitable consumers profitable and in the end make a still lower rate possible. It can be taken on with little addition to the capital account. The cost to the consumer for new equipment will be slight. It will offset nearly all of the recent rate reductions, many of which were unjustified.

I have spent some time in analyzing this situation. Last April I made a report to our company, setting forth these possibilities. A recent survey has shown this report as very conservative. For example, we find that 37 per cent of all lamps sold to our customers last year were from 5 to 10 volts above the line voltage. This is a good improvement over a year previous. Many lamp sales by dealers averaged less than 40 watts per lamp. Most of these off-voltage lamps were of little-known brands and sold by merchants who sell so few lamps that they cannot get a contract with any wholesaler who handles first-grade American-made lamps. Not a schoolhouse in several towns surveyed had a lighting intensity above 6 ft.-candles on the darkest row of desks on even a bright day with all the lamps on. Few business houses outside of the large stores have more than from 3 to 5 ft.-candles. The survey shows, as do similar surveys on other properties, that approximately 50 per cent of the residence consumers use 20 kw.-hr. or less and in some towns 85 per cent of the consumers only average from 15 to 20 kw.-hr. per bill.

Added current on all of these large groups of small customers will, of course, come at the high rate. The bringing of such towns as these out of the red with appliances alone will require many years, whereas a combination of better light and appliance sales will be comparatively easy and relatively quick. It can be made easier if the companies will value their merchandise in terms of new business developed rather than in terms of red or black ink in the merchandising books.

Many companies are now holding back in their merchandising activities because they do not feel like taking a chance on spending money when they are sailing so close to the wind. With this added income from light they would spend money for an appliance activity more freely. Many utilities also have made rate reductions which further cramp the treasury department. It will take a lot of added kilowatt-hours at the low rate for a satisfactory appliance business to absorb these rate reductions. But I do not know of a single rate reduction which cannot be absorbed by this neglected lighting income.

It is particularly necessary at this time of attack that the small user receive a satisfactory service and also that he be made relatively profitable. The development of these small consumers, therefore, should be made a part of the educational campaign which must be put on if we are to counteract the propaganda of the attacking forces.

Making the people light-conscious plus improved economic conditions are bringing customers back onto the line. It is not uncommon to find cities and towns which have as many customers now as they had in 1931, when the customer count was a maximum.

As people become more light-conscious and as the Better Light for Better Sight activities goes forward the sale of appliances will be made easier.

A table recently published in the ELECTRICAL WORLD showed that the merchandising sales of a group of companies have doubled during the last year. One of the shortcomings of utility selling has been the tendency to develop sales along some single-track activity. Great care should be exerted to see that the picking up of this 10 kw.-hr. of lost load should in no way interfere with any other load-building or merchandising activity.

Mid-West Business Promising

IN THE area adjoining Chicago and in northern Illinois I feel that the most promising indication of a sustained improvement in business is the current revival of residential and industrial building activity. Building volume in this area is generally reported to be from 35 to 40 per cent ahead of last year, and at the moment is even showing a sharp contra-seasonal increase. If this tendency may be taken as the long-looked-for corrective to the housing shortage, which has been one of the economic results of the past few years, it, of course, promises something more than temporary improvement along many lines.

In the northeastern rural sections of the state and in the smaller cities farther removed from Chicago the prospect of better crops and better prices for farm produce is beginning to influence buying attitudes. Considerably more interest is being shown in the improvement of farm homes and in the addition of new farm operating equipment, among them electrical appliances.

So far as the whole northern Illinois area served with gas and electricity by the Public Service Company is concerned, the above general indications of improvement are reflected specifically by the two-fold fact that consumption of electricity by residential customers is increasing more rapidly now than at any time since the beginning of the depression and 1935 sales of appliances are now approximately 40 per cent greater than for the corresponding period of 1934. Industrial and commercial consumption is also definitely on the upturn.

BRITTON I. BUDD,
President Public Service Company of Northern Illinois.

Experience in Home Lighting

Some Intimate Details of a Selling Technique That Has Proved Successful and the Results

By F. C. WILSON
Director of Lighting
Iowa City Light & Power Company

LAST SUMMER we decided to organize a systematic home-lighting activity. We sent our director of home lighting, Mrs. Charles H. Wilson, to Nela Park for a two weeks' course and on her return she employed three full-time middle-aged women and a young girl on half time and for two weeks trained them for the work. Then we sent out a letter to domestic consumers, keyed to the Science of Seeing, and work started.

This letter produced good results and gave a readier entry into the home than telephone calls or cold canvassing. In some cases a telephone call was made after the letter was sent out, but mostly the call was made with only the letter to precede it. To conserve the demonstrators' time and increase the calls per day, the letters and calls were scheduled to follow the meter routes. The city was divided into districts, a card system with the name and addresses was set up and the specialist considered most capable of contacting homes in each particular district was placed in that section. A system of records was developed that would keep a clear and accurate summary of results without loading up the department with burdensome paper work. Three of the printed forms are shown on this and the following page.

2/2M-10-1-34 E.A.Co.

Lighting Analysis for Better Light — Better Sight

Address..... Date.....

Name..... Rooms.....

ROOMS	Portable Lamp or Fixture Description	Present Location	Present Lamps	Sight Test Recommendation			New Lamps Needed for Good Lighting	New Merchandise Needed for Good Lighting
				New Position	Shades	Lamp Bulbs		

Ask for 115 volt inside frosted Mazda lamps.

Remarks..... Recommended by

Analyses and recommendation made in the home and left with the customer, with an explanation of the Science of Seeing on the reverse side—a copy is kept

PERIOD OR INDIVIDUAL	RECOMMENDATIONS MADE			INSTALLATIONS MADE					AVERAGE WATTAGE INCREASE	$ OF RECOM'D'S INSTALLED		QUOTA						EXPENSES				EST. ANNUAL REVENUE		
				NUMBER			WATTAGE																	
	NUMBER	TOTAL WATTAGE	AVERAGE WATTAGE	ORIGINAL CALL	CALL BACK	NEW CUSTO. MERS.	ORIGINAL CALL	CALL BACK	PER RECOM-MENDATION	PER CUSTO-MER	NUMBER	WATTAGE	KW. HRS. INCREASE	$ SECURED	BULBS	$ SECURED	LAMPS SHADES FIXTURES	$ SECURED	SALARY	BONUS	SUNDRY	TOTAL	KW. HRS.	AMOUNT	COST PER $ E. A. R.
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56

NAME

PERIOD OR INDIVIDUAL	NUMBER OF								NUMBER OF LEADS					BULBS AND LIGHTING EQUIPMENT RECOMMENDED AND SOLD										SALES OF BULBS		SALES OF LIGHTING EQUIPMENT	
														BULBS			PORTABLE LAMPS			SHADES			FIXTURES						
	CUSTOMERS CALLED ON	DEMS. MADE	DEMS. REFUSED	APPOINTMENTS MADE	APPOINTMENTS BROKEN	CALL BACKS	SERVICE CALLS	SHOPPING TRIPS	EMPLOYEES	CUSTOMERS	DEALERS	TALKS AND EXHIBITS	SUNDRY	RECOMMENDED	SOLD DIRECT	SOLD BY DEALERS	RECOMMENDED	SOLD DIRECT	SOLD BY DEALERS	RECOMMENDED	SOLD DIRECT	SOLD BY DEALERS	RECOMMENDED	SOLD DIRECT	SOLD BY DEALERS	COMPANY (VALUE)	DEALERS (VALUE)	COMPANY (VALUE)	DEALERS (VALUE)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Weekly report on the work of the entire staff

NAME | GRADE OF HOME | OWN - RENT | NO. OF ADULTS | NO. CHILDREN | NO. AGED

ADDRESS | DATE OF CALL

DIST. | FOLIO | APT. | FLOOR | SURVEY MADE BY | DATE TO CALL BACK

SOURCE OF LEAD | TIME SPENT HR. MIN | SINGLE HOUSE | MULTI FAMILY HOUSE | APT. HOUSE

ROOM	PORTABLES AND FIXTURES	AS FOUND		RECOMMENDED		INSTALLED		SUBSEQUENT INSTALLATION				LIGHTING EQUIPMENT	
								DATE		DATE		RECOMMENDED	INSTALLED
		NO. & SIZE	TOTAL WATTAGE	NO. & SIZE	TOTAL WATTAGE	NO. & SIZE	TOTAL WATTAGE	NO. & SIZE	TOTAL WATTAGE	NO. & SIZE	TOTAL WATTAGE	NUMBER AND TYPE	NUMBER AND TYPE

YEAR	KW. HR. CONSUMPTION						KW. HR. CONSUMPTION						
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	TOTAL

DATE OF SECOND CALL | TIME SPENT | DATE TO CALL BACK | DATE OF THIRD CALL | TIME SPENT | DATE TO CALL BACK

DEMONSTRATION | FIRST CALL | SECOND CALL | COMPLETED | IF NOT WHY?

LAMP VOLTAGE | SHADE REFLECTING SURFACES | VALUE OF MOVING LAMPS SLIGHTLY | OR TO OTHER PARTS OF ROOM

CUSTOMERS REACTION TO ABOVE QUESTIONS

WOULD PRESENT EQUIPMENT BE SATISFACTORY WITH LARGER BULBS? | SIGHT METER MEASUREMENTS PRESENT INTENSITY | BRIDGE LAMP | FLOOR LAMP 1 | FLOOR LAMP 2 | TABLE LAMP 1 | TABLE LAMP 2

NUMBER IN FAMILY | CHILDREN SCHOOL AGE | ELDERLY PEOPLE | FIXTURES 1 | FIXTURES 2 | DESK LAMP | OTHER

PART OF DEMONSTRATION CREATING MOST INTEREST

PART CREATING LEAST INTEREST

MAJOR APPLIANCES OWNED | WAS SHOPPING ASSISTANCE REQUESTED | WHEN

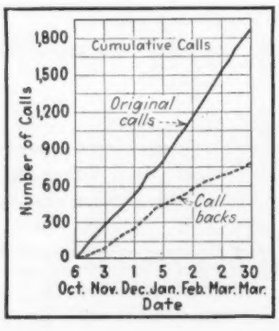
CUSTOMERS ATTITUDE OR COMMENTS

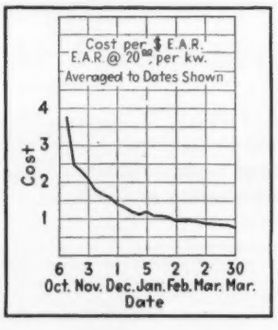
Daily activity report made out by the demonstrator each evening

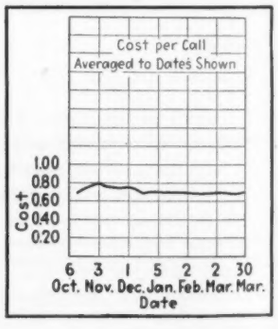
An analysis and record sheet was filled out in the home on the first card and a copy left with the customer for study. At the end of the day this information was transferred to a permanent customer's history card and a daily activity report made out by each demonstrator. The entire week's activity was summed up on a weekly report. These home-lighting specialists did no selling, but frequently prompted the purchase of equipment needed to bring the lighting up to standard.

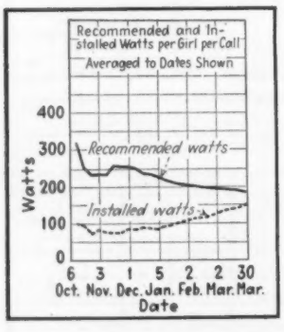
The results of six months' work are shown in the accompanying graphs. An average of 6.3 calls and call-backs were made per day, each call averaging an hour and twenty minutes including transportation. Call-backs were made on 40 per cent of the customers. Wattage recommended averaged 816 and the installed wattage 278 per girl per day. Recommended wattage per call was 185 and the installation per call 148, showing an installation of 80 per cent of the increase recommended. Percentage of wattage installed by the 40 per cent of the customers on whom call-backs were made (114,057 watts) was 33 per cent of the wattage recommended to all customers (342,580 watts). Customers purchased $1,332 worth of equipment, or an average of $3.17 per girl per day. The cost per call figured 66 cents and the cost per dollar of estimated annual revenue was 75 cents, estimated at the very low figure of $20 per kilowatt.

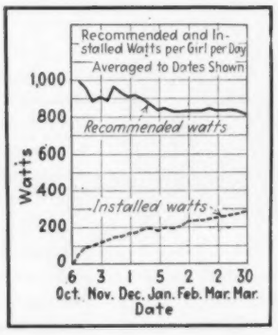
We believe that if the call-backs had been increased to 80 per cent the wattage installed would have doubled and the cost per dollar of revenue cut nearly in half. Finally, company records show increases in residential load for the first three months of 1935 over the corresponding months of 1934. January was 14.6, February 29 and March 16.6 per cent better than last year, which is an interesting confirmation of our records of accomplishment in this home-lighting activity. The management feels that from a dollar and cents viewpoint the returns were excellent and that in residential lighting it is entering a virgin field, with the probabilities of still greater development. Also there is the intangible item of customer good will that cannot fail to be stimulated by the very real service the demonstrators render in each home.

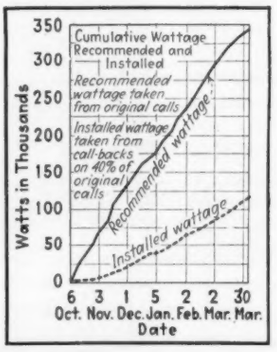


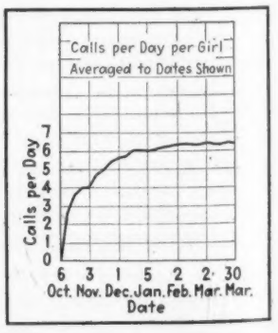








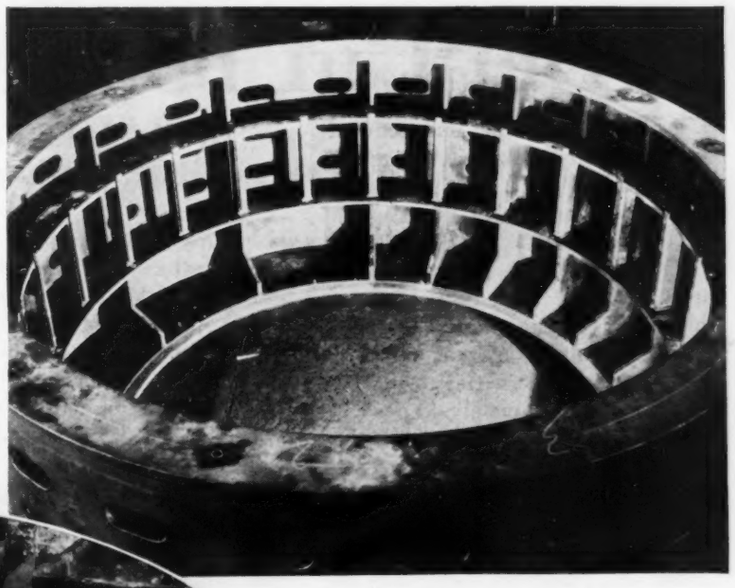




Graphical analysis of the results of the Iowa City home-lighting activity for a period of six months

Cost and Weight Reduced by Welding Fabrication

IN FEW other fields than in the production of frames and bases of large electric motors and generators have the advantages of welding fabrication over casting been more strikingly realized. Lighter and stronger constructions at costs sharply reduced are easily obtained. Here are evidences from the shop of the Electric Machinery Manufacturing Company. The production cost of these arc-welded generator stator frames is 30 to 40 per cent less than would have been the cost of castings.



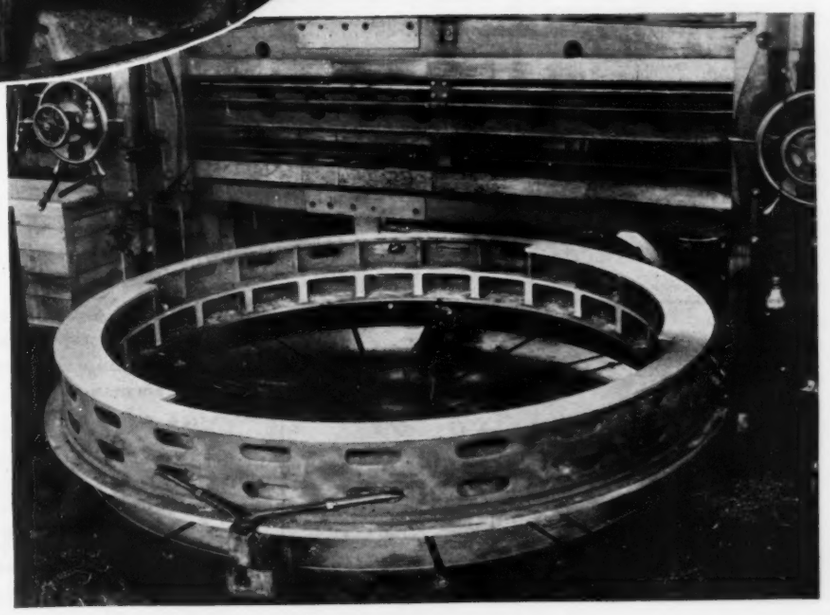
Half the weight of a casting

This stator ring and base, built by arc welding for a 1,000-kva. vertical generator, weighs only 8,400 lb., half as much as if cast. Welding reduced fabricating costs 30 to 40 per cent. The unit is composed of three rings built up entirely of steel flats welded together by the electric arc. The top ring is 1-in. plate, center ring ⅞ in., bottom ring 1¼ in. The vertical spacing and stiffening members, supporting the wings, are made of ⅜-in. plate.

Photos courtesy Lincoln Electric Company

Pattern cost abolished

An all-arc-welded sub-base for holding the stator ring in a 6,250-kva. vertical generator. Arc welding saved 50 per cent in weight and $250 in pattern costs alone. The outside diameter of the base is 117 in., depth 20 in., weight 4,730 lb. The top and bottom rings are 1-in. plate. The vertical spacers and stiffeners are ⅜-in. plate. In building this base the bottom ring was cut from a solid piece of 1-in. plate. The vertical members were then properly positioned, held in place and welded to the base. These vertical members were braced one against the other completely around the base by lengths of steel plate welded to the base and to the vertical members. This welding completed, the top ring was welded to the vertical members.



Machining an arc-welded frame

This ring is for holding the stator core in a 312-kva. vertical generator. It weighs 4,100 lb. Added to saving in weight, arc welding reduced fabricating costs approximately 35 per cent. The plate in the bottom is 1 in. thick, that of the vertical members ⅞ in., of the top ring ¾ in. The outer ring, containing the ventilating holes, is ⅜-in. plate.

Protection for 13-Kv. Switches

Phase Isolation Scheme Safeguards Line-Sectionalizing Air-Break Switches Against Lightning Hazards

By H. N. EKVALL
Engineering Department
Philadelphia Electric Company

PROTECTION of line-sectionalizing, air-break switches against lightning failure has been given serious consideration as the result of several years' investigations of trouble by the Philadelphia Electric Company. During this period switch faults were the most important single source of lightning trouble along the 13-kv., three-phase aerial lines and represented approximately 40 per cent of the total faults. It was evident that some effective means of protection less costly than the conventional-type lightning arresters was needed. With this in mind, a form of protection referred to later as "phase isolation" was developed, based on a study of the nature of damage to the equipment.

The switches in service are of the type shown in Fig. 1. During lightning storms flashovers of the switch insulation occur due either to direct strokes or to induced surges. When the insulation of adjacent phases flashes over simultaneously, phase-to-phase short circuits occur through the horizontal, steel-operating shaft, causing service interruptions. These short circuits frequently cause serious burning and even shattering of the porcelain insulators on either the switch proper or in the dead-end position. Lightning surge flashovers, alone, apparently cause no damage to the porcelain insulation.

Therefore it is apparent that if the short circuits can be prevented there will be no service interruptions and no damage to switch insulation. Accordingly, a method of protection has been developed which does not reduce the number of lightning surge flashovers, but tends to prevent formation of phase-to-phase short circuits. This has been accomplished to a large degree by inserting insulators in the horizontal, steel-operating shaft, as shown in Fig. 2. Short circuits to ground are prevented by the wood supporting structure and vertical wood operating rod.

Based on the three-year average performance, phase-isolated switches experienced 54 per cent less trouble than those without phase isolation. Of the two cases of trouble on the protected switches, one was due to a direct stroke (indicated by pole splintering) and the other to an unusually severe discharge (evidenced by the extent of damage in the vicinity). In the latter case the switch was located at an intersection where two others without protection also failed. A fourth switch at this intersection with phase-isolation protection did not fail. Further evidence of improved performance is shown by the fact that a number of phase-isolated switches were unaffected by lightning discharges which caused trouble on unprotected switches only a few spans away.

During the past three years there have been nearly 500 operations (opening or closing) of phase-isolated switches without breakage of the pedestal insulators. About half of the switches have had two or more service

[*Continued on page 84*]

13-Kv. Switch Failures Due to Lightning

Philadelphia

Type of Switch	Year	Switches in Service	Switch Failures	Failures per 100 Switches
Phase	1932	20	0	0
	1933	45	2	4.4
Isolated	1934	45	0	0
3-year weighted average				1.8
All others	1932	476	12	2.5
	1933	382	24	6.3
	1934	382	12	3.1
3-year weighted average				3.9

Rated at 25 kv. and normally equipped with 35-kv. pin-type insulators either three 6-in. (diameter) or two 10-in. (diameter) disk-type insulators in the dead-end position for holding the line wires. The blades are gang-operated by means of a horizontal steel shaft actuated by a vertical wood rod which extends down the pole approximately 16 ft. The switch units are not grounded and are mounted on double wood crossarms at the top of the pole.

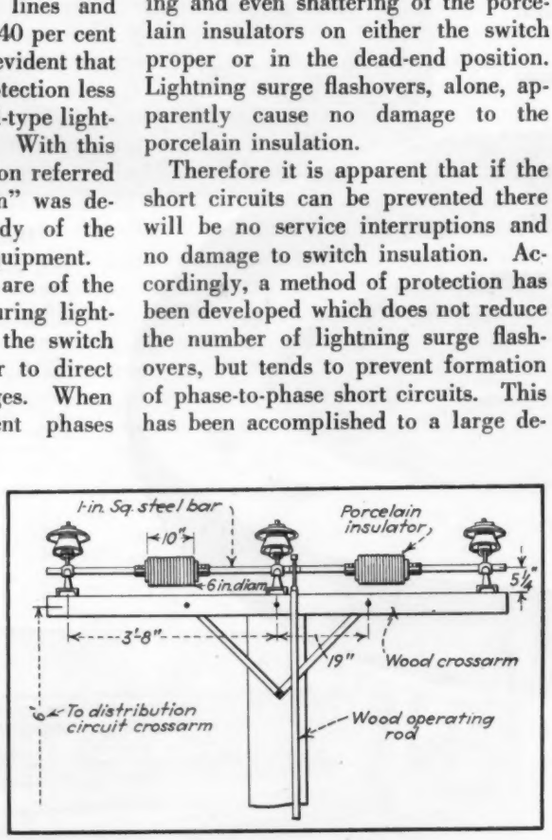


Fig. 1—Schematic arrangement of 13-kv. line switches

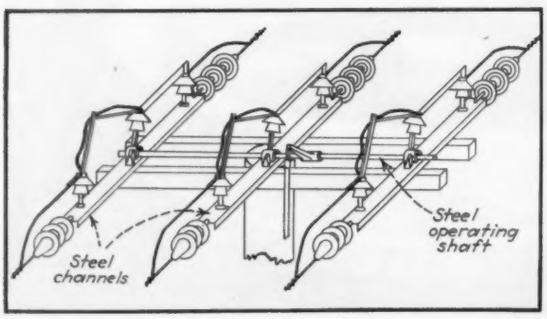
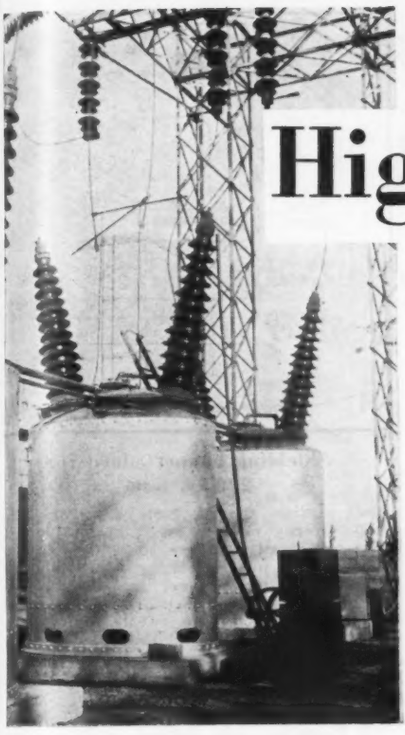


Fig. 2—Phase-isolating insulators and wooden operating rod improve performance

Standard pedestal-type insulators are provided with malleable-iron adapters for rigid connection to the square shaft. These insulators, in conjunction with the wood crossarms, provide sufficient insulation between phases to reduce materially switch failures.



High-Voltage Bushings Tested in Place

Portable Power-Factor Test Apparatus Discloses Weakening of Condenser Bushings, Which Was Confirmed by Dismantling

By C. F. BENHAM
Assistant Engineer Pacific Gas & Electric Company

A SURVEY of existing apparatus on the properties of the Pacific Gas & Electric Company revealed a considerable number of circuit breakers and transformers equipped with micarta type condenser bushings of older design which had seen years of service and a few which had at one time been subjected to moisture conditions due to "breathing." Inspection of these bushings showed no indications of deterioration, but it was felt desirable to have more conclusive evidence of their integrity. Megger readings have not been entirely convincing.

The value of dielectric loss measurements and power-factor tests as a means of determining insulation characteristics was recognized, but the removal of all these bushings and their transportation to a central laboratory for such investigation entailed an expenditure of time and money out of proportion to the benefits to be obtained. The problem was finally solved by an appeal to the manufacturers that a portable power-factor testing set for obtaining readings directly from bushings in position in the apparatus be used.*

Tests were made on a total of 56 circuit breakers and 30 transformers ranging from 69 kv. to 220 kv. and involved 358 micarta condenser bushings, including some spares. More than 95 per cent of the apparatus was found to be in normal condition. Ten bushings were found with a power factor higher than normal, two of which were sufficiently high to warrant their removal from service immediately. On dismantling these bushings charred leakage paths were found at the top end extending from the central conductor some 6 to 7 in. over the wound insulation surface. Both bushings were of an early design, in which the seal was not as positive as in the more modern bushings, and it was concluded that moisture had entered, lowering the surface resistance of the insulation and resulting in surface leakage.

*See page 62, this issue.

Moisture common difficulty

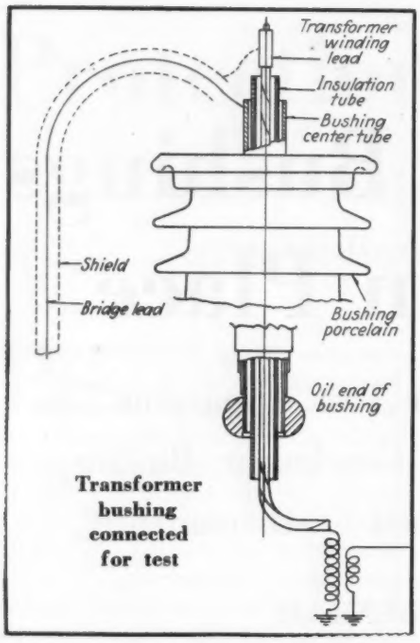
Power factor of the remaining eight bushings was not sufficiently high to be regarded as hazardous, but the values did approach what may be regarded as the maximum limit for safety and showed possibilities of trouble if the deterioration were to increase. It was the manufacturer's recommendation that they be removed or, if left in service, that periodic tests be made to determine whether their condition remained constant or became progressively worse. Two of these bushings were finally dismantled for investigation, and after examination it was concluded that moisture was once more the cause of the higher power factor. The penetration had not been great, however, as leakage paths had not yet begun to appear.

Some time after the power-factor test was started a revamping program was carried on to replace one obsolete type or bushing cap which was not sufficiently watertight. This revamping program included some 69-kv. bushings which had shown a normal power factor on test. On opening these bushings the gum at the top was found to contain an appreciable amount of moisture. From the fact that the condition had not been reflected in the power-factor readings, the conclusion was drawn that moisture must penetrate into the gum for a considerable distance before detectable losses appear.

Oil found with high power factor

This was primarily a bushing test and oil tests were made only as a means of localizing faults. However, four cases were found of oil showing a high power factor. In some of these cases the dielectric strength of the oil, as shown by breakdown test in the standard test cup, was high. The theory has been advanced that this seeming paradox may be accounted for by polar† characteristics formed by oxidation. So long as oil in this condition is free from contact with moisture, the oxidation products, chiefly acids and esters, have little effect upon its dielectric strength. Oxidation greatly increases the ability of the oil to hold moisture, however, and for this reason the use of oxidized oil is questionable. The oxidation of oil can, of course, be found by a series of

†W. N. Stoops, *Physics*, page 322, Vol. 2, No. 5, May, 1932.



Transformer bushing connected for test

Insulating tube temporarily slipped over the winding lead from the outer end isolated the bushing central tube sufficiently to permit taking power-factor readings on the bushing alone. This removed the necessity for opening the tank except in cases where localizing tests became necessary.

chemical tests, but experience here shows that oxidation will be indicated by a power-factor test when dielectric breakdown tests will not disclose it.

No trouble was encountered with lift rods or guides in the 56 circuit breakers tested. In no case in which both bushings of a pole unit had normal power factors did the power-factor reading with the breaker contacts closed and with clean lift rods and guides reach a value of 0.005 higher than the mean power factor of the two bushings.

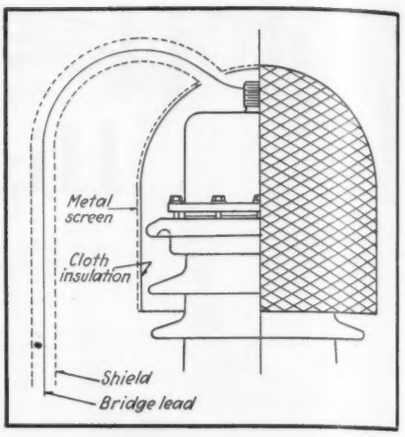
The percentage of error in the portable power-factor bridge itself is negligible as compared with the possibilities of error in its application for test purposes. It should be borne in mind that the function of the bridge is to measure all capacitance and a discerning watchfulness must be maintained to insure that values recorded actually represent what is sought and are not affected by capacitance to ground of other portions of a connected circuit, or distorted by external capacitance to or from other surrounding grounded objects or other potentials. With reasonable care exercised in this direction the percentage of error in power-factor readings may be considered as negligible for all practical field purposes.

As is the case with many tests of this nature, more time was consumed in preparing for the tests than in taking the actual readings. The average time required for taking a breaker from service and testing was one to 1½ hours. The number of breakers or transformers tested in a day depended on the time to take the apparatus from service, the time to localize faults and clear them, the number of units to be tested at any one location and the time required to move from one location to the next.

Method of testing circuit breakers

Although the investigation was primarily a bushing test, the ability of the power-factor bridge to show the weakness of other dielectrics of the apparatus, such as oil, lift rods, guides, etc., was not overlooked. The final procedure was as follows:

1. Circuit breaker contacts and disconnecting switches were opened.
2. Incoming and outgoing leads were disconnected from the bushing to eliminate the effect of any insulator losses external to the breaker.
3. Power-factor bridge was set up near one pole of the circuit breaker with its high-tension lead connected to the bushing terminal and its ground lead to the metal breaker frame. The bridge testing transformer was connected to a 110-volt supply.
4. Potential was applied, a bridge balance obtained and the power-factor and capacitance values of the bushing recorded.
5. The bridge high-tension lead was moved to the other bushing of the same pole unit and operation (4) repeated.
6. Circuit breaker contacts were closed and readings again taken.
7. The same procedure was followed on the remaining pole units.



Shielding bonnet added for 220-kv. tests

Electrostatic charge from live overhead lines on the bushing as isolated for test was sufficiently intense in some cases to cause errors in the readings. Metal screen bonnet was placed over the bushing cap but insulated from it and connected to the shielding circuit of the power-factor bridge, thus in effect by-passing the interference to the shielding circuit.

In the event of readings considered abnormal being obtained from either one of operations (4) or (5) on any pole unit, further steps to localize the abnormal condition of the bushing in question were taken as follows:

8. The porcelain weather casing of the bushing was shielded to eliminate surface leakage and readings were taken.
9. The oil in the tank was lowered sufficiently to permit cleaning the porcelain arc shields and readings again taken.
10. The arc shield was removed, the lower end of the bushing cleaned and readings repeated. The oil in the arc shield was

[*Continued on page 77*]

Tabulation of Bushing Power Factor as Found on the Test

Kv. of Bushing	Manufacturing Period	Total No. of Bushings	Number of Bushings of Various Power Factors								
	Power Factor in Per Cent.....		0.05	0.5 to 1	1 to 1.5	1.5 to 2	2 to 2.5	2.5 to 3	3 to 3.5	3.5 to 4	4 to 4.5	Above 4.5
66	1924 to 1926	84	1	3	22	36	18	3	1	0	0	0
88	1924	14	0	1	4	5	2	2	0	0	0	0
110	1921	48	1	5	17	15	3	2	2	1	1	1
110	1924	64	0	25	25	8	1	4	1	0	0	0
115	1929	12	0	12	0	0	0	0	0	0	0	0
154	1924	18	0	4	3	4	1	5	1	0	0	0
187	1921	44	0	4	19	9	4	3	0	0	3	2
187	1924	74	0	29	30	10	4	1	0	0	0	0
Total.....		358	2	83	120	87	33	20	5	1	4	3

All the above power factors have been corrected to 25 deg. C.

NOTE—The dates shown in the table are for the purpose of identifying periods of manufacture when different constructions and materials were used rather than to give the age of the bushings.

Multiple Connector for Secondary Junctions

With Eight Cable Connections Cost Is Two-Thirds That of Ordinary Spliced Joints—Each New Joint at Half the Cost

By P. K. MOFFATT . . . T. COONS

Distribution Engineering Department, Potomac Electric Power Company, Washington, D. C.

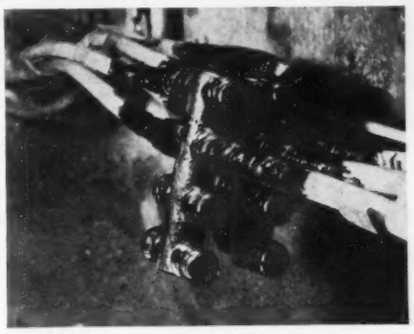
TO MEET the need on our underground distribution system for a low-cost service tap and junction box the insulated multiple connector has been adopted. This connector was developed along with the practice of using non-leaded splices and non-leaded cables on secondary distribution and of using taped service splices on rubber-leaded secondary mains in a.c. distribution conduit lines. There being relatively few secondary taps in conduits with primary feeder lines, it therefore follows that most of the service splices are taped joints.

From four to eight services are run out of each service manhole in residential areas and from one to three in commercial areas. The limited space in service manholes imposed size limitations on any new developments. Easy and quick access for connecting and disconnecting cables, together with such rigidity as to insure tight connections when subject to vibration, were primary requisites. In addition, reasonable security against dampness and mechanical and chemical injury encountered in ordinary service were demanded.

Aids making and unmaking splices

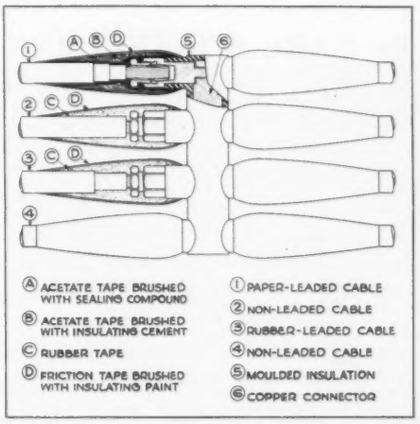
The attempt to solve the problem—that is, to find an economical method of connecting or disconnecting services or replacing secondary mains without tearing down and rebuilding the service splice—led to the consideration of several designs of tap boxes. All of these were too expensive in comparison with splicing methods in general use; *i.e.*, services brought into conventional sweated joints using split copper connectors and solder.

The problem was thoroughly studied in co-operation with the Burndy Engineering Company and a multiple mechanical connector covered with molded insulation was adopted. The necessity of connecting rubber-leaded and rubber-braided services and mains to paper-insulated cable impregnated with oil or other compounds harmful to rubber resulted in the immediate purchase of a quantity of these connectors. The connector may be used as a substitute for a junction box between the paper-insulated cable and other cables, it being so designed as to provide an effective oil or compound stop joint on any branch. The saving and convenience are apparent since it does away with the necessity of bringing out a stub from a stop joint and splicing branch joints to the stub. The cost of the connector installed with four connections is about equal to the cost of the stop joint with the stub on paper-leaded, compound-impregnated cable without the branch joint.



Junction box function performed by multiple connector

Connectors are available for eight, six or four cables as required by local conditions. When outlets are not in use insulating plugs inserted in the projections keep the body waterproof. Should it be desired to add new services these plugs may be removed and cable clamps screwed on.


Ⓐ ACETATE TAPE BRUSHED WITH SEALING COMPOUND
Ⓑ ACETATE TAPE BRUSHED WITH INSULATING CEMENT
Ⓒ RUBBER TAPE
Ⓓ FRICTION TAPE BRUSHED WITH INSULATING PAINT
① PAPER-LEADED CABLE
② NON-LEADED CABLE
③ RUBBER-LEADED CABLE
④ NON-LEADED CABLE
⑤ MOULDED INSULATION
⑥ COPPER CONNECTOR

Any types of cable may be joined at same multiple connector

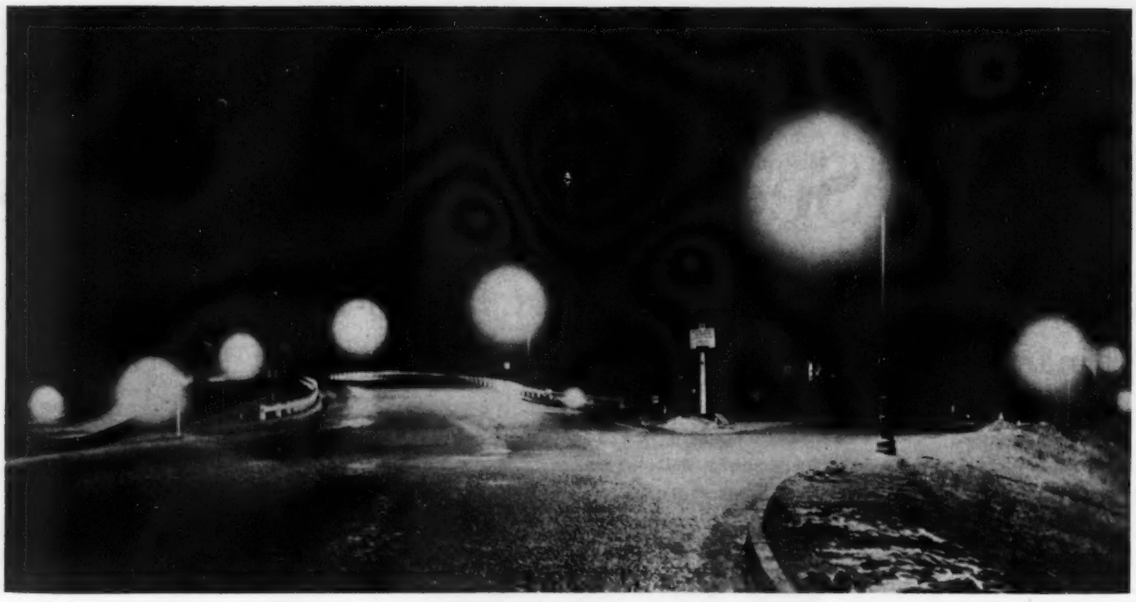
Cable connections are made by screwing the clamps into the body and after removing enough insulation from the cable to slip on the nut and cone, screwing down the nut and taping the exposed metal parts.

The insulated multiple connector consists of a solid copper body over which insulation is so molded as to allow cable clamps to be screwed into the body and insulated by taping. The cable clamps fit into tubular projections of the molded insulation which extend from either side of the body perpendicular to its longitudinal axis. Approximately one inch of each cable clamp extends beyond the insulation in order to provide a complete stop joint when paper cable impregnated with oil or other compounds is used. The cable is gripped in the clamp by means of an internally serrated compression cone closed down by tightening a nut.

Electrical tests of the specially compounded rubber molded insulation show a flashover from 17 kv. to 18 kv. and puncture from 30 kv. to 36 kv In order to protect the metal parts from the corrosive action of the sulphur in the rubber they are completely tinned.

Any size of cable that does not cause excessive current to flow through the

[*Continued on page 61*]



Dangerous clover-leaf intersection at Revere, Mass., equipped with 10,000-lumen sodium-vapor units, to demonstrate the life-saving value of good highway lighting

Highway Lighting–Face to Face

Responsibility for Reducing Traffic Fatalities in America Rests Primarily on the Automobile Industry and the Builders and Users of the Roads—But the Power Companies Have Vital Part to Play

By EARL WHITEHORNE

SO MANY statistics saturate our world today that there is little thrill in more printed figures—fresh or familiar. But when the numbers stand for men, women and children done to unexpected violent death on the open road, it stops any reader. Therefore, there is hardly an electrical man who has not given some uneasy thought to the appalling loss of life that is being reported year after year from traffic accidents in this country. And the proofs that have been published that so considerable a share of these fatalities could be prevented by the adequate lighting of highways have brought it home to each of us that the electrical industry should do something about it.

The purpose of this article, however, is not just to quote the figures again on the number of killed and injured in automobile wrecks and collisions, nor to cite the many experimental highway lighting installations and what they have proved. It is easy enough to tell the power companies that they should lead in the solution of this urgent problem, which so concerns the whole American people. But the question is how to get action? For though several utilities have already established highway lighting demonstration sections, the attitude of the industry in general is apathetic, for the very practical reason that there appears so little hope of getting anywhere because of the political factors involved.

The experience of the power companies with street lighting has not been a happy one. Therefore, the idea of any large extension of highway lighting in these times, involving new relations with county and state authorties, raises many anxious questions. Who will build the lines? Who will own the lighting units? And, if so, will the public investment or the rates charged tempt the politicians to build state power systems? It is a prospect packed with possibilities for trouble.

There is only one way, it seems to me, that any power company man can hope to face this issue with a true perspective, and that is to approach it as a citizen and a family man. As such he cannot dodge the fact that 36,000 people were killed and 954,000 injured in automobile accidents in 1934. In a word, through this last eighteen months as many American lives have been sacrificed to traffic as the nation lost in killed and wounded in France while we were in the World War over an equal period. And these were not soldiers with guns in their hands. They were neighbors, friends and relatives. Every day 100 died, but among so many motorists and along such endless miles of road, nobody saw more than an occasional tragedy and nothing is done.

The fact that 20,950 of these fatalities occurred after dark is striking,

They were the ghastly product of 422,490 night accidents that involved an economic loss of $900,000,000, according to the insurance companies. For there is a dollar side to it, also. The total waste of money from all automobile accidents last year is calculated as $2,500,000,000.

One promise of relief

Many things undoubtedly will be done to make the highways of America less hazardous. The Superintendent of the New York State Highways Department recently said that speed was the chief danger and suggested that manufacturers equip all passenger cars with governors preventing an excess of 50 miles an hour for passenger cars. Maybe so. Perhaps more police and sterner law courts—more prison sentences and suspended licenses—will put restraint upon the reckless driver. But these reforms always come slowly in response to an aroused public opinion. Meanwhile, however, one thing has been discovered that offers a promise of relief.

Engineers of the lamp manufacturers and several utilities have been checking traffic and studying accidents on lighted and unlighted highways for five years or more. Special experimental installations of incandescent, sodium-vapor and high-pressure mercury equipment have been located at dangerous highway intersections near Cleveland; Schenectady, Syracuse; Pompton and Asbury Park, N. J.; North Adams and Newton, Mass.; Rochester, Minn.; Hannibal, Mo., and Pasadena.

Data of absorbing interest have been developed. For example, on the new Mount Vernon (N. Y.) Highway it was found that the number of accidents increased 2½ times when the lighting was discontinued, and on two tests in Westchester County, New York, night accidents increased 37 per cent when the light was cut off. Likewise, a State of New Jersey test on comparable sections of Routes 25 and 26 showed 36 per cent of the accidents at night on the lighted sections and 56 per cent at night on the unlighted section. Checks outside Schenectady over a period of four years without light and four years with show that though day accidents have increased 9.7 per cent, night accidents have decreased by 36.4 per cent.

These cases are too well known to utility men to need repeating here. Out of it all comes impressive evidence that the danger of fatal accident is 64 per cent greater by night than by day. About 56 per cent of present-day traffic accidents occur after dark and at least 35 per cent of these are preventable by proper lighting. In terms of human life, this would mean the saving of the lives of some 7,000 people annually if all our highways were properly illuminated. And since most of the accidents occur on the primary highways, most of these night fatalities could be avoided if just our principal thoroughfares were lighted.

To a power company man, thinking in terms of capital investment, line construction and maintenance of equipment, the lighting of the 360,000 miles of primary highway sounds like an impossible project. But don't let's look at it like electrical men. It will not look impossible to a citizen. America has built her roads, surely she can light them, if it is necessary. The question is how should the public proceed to get this job done?

Good roads not complete

Well, the automobile industry got the roads built for us. They sold the cars and the idea of motoring for pleasure and business. They promoted the demand for good roads and constructively guided legislation to accomplish it. The construction industry developed the road-building technique and equipment. The cement industry helped the contractors evolve the modern concrete roadbed that seems to be adequate and permanent. These are the people who built our modern highways—only they didn't complete them.

Our modern roads have developed step by step. In the beginning asphalt appeared to be adequate. Then we found concrete was necessary. First a two-lane road was ample. Now we build them three and four cars wide.

This Syracuse installation, on the West Genessee Turnpike, was extended from 10 to 25 sodium-vapor units when the local authorities saw its worth for accident prevention

How Street Lighting Saves on Wastes

Figures Compiled by the Travelers Insurance Company on 22 cities that spent more money for light and 20 cities that spent less at the low point of the depression

22 CITIES WITH INCREASED STREET-LIGHTING BUDGETS SAVED BY SPENDING	
Total population	15,358,000
Amount increase in street-lighting costs	$1,429,321
Increased cost per capita	$0.093
Automobile fatalities during hours of darkness	
1931	1,648
1932	1,255
Per-cent decrease	23.8
Total automobile accidents during hours of darkness	
1931	44,496
1932	33,885
Per-cent decrease	23.8
Economic saving	$31,833,000
Economic saving per capita	$2.07

20 CITIES WITH DECREASED STREET-LIGHTING BUDGETS LOST BY SAVING	
Total population	5,618,000
Amount decrease in street-lighting costs	$1,101,389
Decreased cost per capita	$0.19
Automobile fatalities during hours of darkness	
1931	641
1932	689
Per-cent increase	7.4
Total automobile accidents during hours of darkness	
1931	17,307
1932	18,603
Per-cent increase	7.4
Excess economic cost	$3,888,000
Excess economic cost per capita	$0.69

The Figures Speak for Themselves

We know that banked curves, grade crossing elimination and bypasses for all cities are coming. We are discovering now, also, that lack of lighting is a fatal defect. So the highways will soon have to be lighted, too. And they will be, for the automobile, cement and construction industries will not indefinitely risk the popular reaction against the automobile that will sweep across this land some day when America wakes up to this growing menace.

The only question is—when will these several industries take hold and get it done? For the cost of installing and maintaining this lighting is not a barrier. If the money now being diverted by the states from the car license and gas funds for other than road purposes were spent where it is supposed to be there would be enough to finance this work as fast as it could be done. And the Highway Users Council is striving now throughout the country to stop this diversion and put the money where it belongs. The Highway Users Council is composed of the automobile manufacturers, the concrete people, the construction industry and the large users of the highways, like the bus and trucking companies. And to all these interests the lighting of the primary highways has an immediate dollar value.

Last year, for example, the bus operators of the country paid out $27,000,000 for insurance against personal liability and property damage. If they could reduce the number of accidents along the routes they travel this insurance cost would immediately come down. And the insurance companies are greatly alarmed at the present situation. The Travelers in Hartford has been a leader in this research on the influence of lighting on accidents.

The path is plain, it seems to me. The people who built the roads are the people to get them lighted. The Automobile Manufacturers Association is ideally organized to carry the torch in such a crusade. It can awaken public interest, stimulate legislation and guide construction as no other influence in this country can.

What the utility can do

What part, then, should the power companies play in such a program? They should not lead the movement. This is not a job of promoting lighting. It is a job of reducing accidents. Light happens to be the preventive. That's all. The power industry would be the wrong advocate before the legislatures, the wrong promoter of public opinion. But there are two things that it must do.

First—The power companies must demonstrate what good highway lighting is. Few people know today and the first question that any legislator would ask is, "Where can I see what you call good highway lighting?" So there must be demonstrations of highway lighting outside every state capital and every important city in the land, enough so that the motoring public will soon see the advantages of adequate illumination and demand the protection that it gives. When this demand comes something will happen.

Second—The power industry must go to work and develop the basis on which the public utilities and the state authorities should co-operate in installing and maintaining this highway lighting. They must evolve a form of contract that will take care of the financial, engineering and political factors that are involved. They must help advance the technique of highway lighting and establish the operation of these systems on sound economic lines. There is much work to be done here, too.

But, fortunately, the power industry need not hesitate to undertake this—its part of the program. In fact, the work is already under way. The Street and Highway Committee of the Edison Electric Institute is already interested. Also the Pennsylvania Electric Association, the Empire State Gas and Electric Association and other groups. The New Jersey State Motor Vehicle Department has been most active in encouraging the idea. But all those power companies that have actually installed demonstration sections of model highway illumination have found that the investment pays for itself handsomely. The Southern California Edison Company, the Niagara Hudson Power Corporation, the Jersey Central Power & Light Company and others that have been pioneers in this advancing program have all found that these demonstrations immediately became a valuable selling influence. State and municipal authorities naturally become interested. Town councils drive over and take a look and better lighting follows in neighboring communities, because people clamor for it. And increased street lighting income soon justifies the demonstration—aside from the other considerations.

To cite these experiences would make too long a story—beyond the purpose of this article. But it is worth the telling, and no man can visit such an installation as that near Asbury Park without becoming enthusiastic. When I swung round a curve down there one night and clearly saw a brown dog sitting on the concrete a block away I was sold. You get a new concept of what light can do to make the highways safe. And with 5,000 lives a year to save, it is the most important job to be done in America today—bar none.

Utilities Hold Their Gains

JULY revenue for electrical energy was 3.2 per cent greater than a year ago, the aggregate for the country as a whole being $151,214,800, according to preliminary figures announced by the Edison Electric Institute. This was 7.3 per cent above the depression July minimum of 1932, but was still 2.7 per cent under the month's record attained in 1931.

While no new high levels were reached as to revenue, more energy was generated and sold to ultimate consumers than at this time in any other year. The output of 7,822,000,000 kw.-hr. was 9.2 per cent more than a year ago. The average daily production rose from 247,000,000 kw.-hr. in June to 252,500,000 kw.-hr., thereby closely matching the winter months. Abundance of water raised the hydro output 37.1 per cent over 1934, while thermal output fell 5.2 per cent.

Energy sales were the highest for any July but revenue lags. Domestic rate drops to 5.17 cents.

Sales increased 7.9 per cent over 1934 and 2.8 per cent over 1929, the record year for kilowatt-hours. Progress was made in all branches of load building with one minor exception. Domestic consumption rose 10.1 per cent over that of July, 1934, establishing a new record for the month 64 per cent higher than in 1929. Industrial energy sales were up 8.0 per cent and surpassed the July figures of all other years except 1929 and 1930.

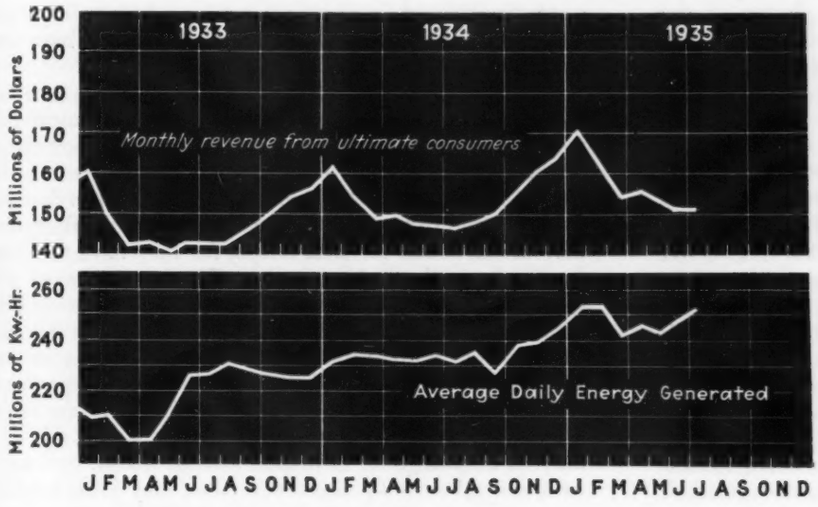


Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1935	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent. Inc.
July	151,215	+3.2	7,822	+9.2	3,321	+37.1	4,501	—5.2
June	151,436	+2.8	7,416	+5.6	3,242	+26.9	4,174	—7.2
May	153,203	+3.6	7,556	+5.1	3,511	+17.3	4,045	—3.8
April	156,069	+4.1	7,368	+5.3	3,423	+ 4.2	3,945	+6.7

Table II—Regional Revenue and Energy Output in July, 1935

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	151,215	+3.2	7,822	+ 9.2	3,321	+37.1	4,501	— 5.2
New England	12,558	+1.6	511	+ 9.8	216	+32.5	295	— 2.4
Middle Atlantic	42,559	+1.7	1,924	+11.4	670	+67.5	1,254	— 5.7
East No. Central	35,807	+6.8	1,808	+ 9.2	197	+97.1	1,611	+ 3.3
West No. Central	12,697	—1.1	551	+14.9	187	+127.4	364	— 8.3
South Atlantic East So. Central	18,238	+2.0	880 295	+ 7.9 — 0.3	513 245	+28.2 + 3.3	367 50	—11.7 —16.0
West So. Central	8,680	+2.7	428	+ 6.1	15	+332.0	413	+ 3.0
Mountain	4,648	+7.8	309	+36.2	256	+47.0	53	+ 3.3
Pacific	16,028	+4.9	1,116	+ 4.9	1,022	+18.1	94	—52.8

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary.

Pickup in mining states

In the Rocky Mountain area the energy output was 10 per cent greater than in June and 36.2 per cent above July, 1934; in the eastern and central industrial areas the year's increase averaged about 10 per cent. The decline of 0.3 per cent in the East South Central region, shown in Table II, is explained by a jump in non-central-station output, presumably at Muscle Shoals, which feeds into the central station supply. Revenue improved substantially in the East North Central and Mountain regions.

The price of energy for domestic use dropped further, to an average for the latest twelve-month period of 5.17 cents per kw.-hr., against 5.37 cents for the preceding twelve-month. Consumption per customer rose slightly from 648 kw.-hr. in the June year to 652 kw.-hr., compared with 617 kw.-hr. a year ago. The average monthly bill remains at $2.81. Following a mid-year analysis the number of domestic customers is given as 20,859,006, an increase of 564,730 over July, 1934.

Table III—Allocation of Energy July, 1935

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,796	+ 9.6
Lost in transmission, etc.	1,531	+17.1
Sold to ultimate consumers	6,265	+ 7.9
Domestic	1,052	+10.1
Com'l, small light and power	1,128	+ 6.3
Com'l, large light and power	3,468	+ 8.0
Municipal street lighting	170	+13.3
Railways—street, interurban	329	+ 1.6
Railroads—electrified steam	67	+25.6
Municipal and miscellaneous	51	— 3.2

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

A Farewell to "Boloney

Little Napoleons and Don Quixotes on the Way Out—Road to Recovery Now Labeled "Caution, Men Working"

By RAYMOND S. TOMPKINS

NOT long ago the Hon. Alfred E. Smith warned the country against the "Boloney Dollar." Today there are men who believe the country needs a similar warning against "Boloney Electrification."

The boloney dollar was a dollar which was about four-fifths boloney and one-fifth dollar. Boloney electrification would be about four-fifths boloney and one-fifth electrification.

The electrification of America is the dream of the power people and the hope of the country. But not boloney electrification. Yet, unless the country has learned its lesson, boloney electrification is the kind it will get.

What is it? The simplest way to explain it is to describe its disciples. Boloney electrification was the goal of two groups of men with whom the American public has had a close acquaintance for a decade or more, the Little Napoleons of Utility Finance and the Don Quixotes of Social Reform.

HONEST electrification appeared to be the goal of both these groups of gentlemen, but it was not. The goal of the Little Napoleons was the personal sockful of dough acquired by guiding large aggregations of patriotic but gullible Americans on speculative sprees. What the goal of the Don Quixotes of Social Reform was is not so easy to say. In their own words, it was "a more abundant life," an "America made over," a "liberation from the power autocracy."

Both groups had the same "line." Both talked grandly of the electrification of America. Both fooled a good many people because up to date all either group has accomplished is to give everybody a headache.

The whole business has been a lesson to the country. Whether the lesson will stick or not is another question. There are observers of the American scene who believe that it will not soon be possible to make a sucker out of an investor again by selling him watered stock in the name of an electrified America. There are also observers who believe it will not soon be possible again to make a sucker out of a patriotic citizen by selling him socialism in the name of an electrified America. On the other hand, there are observers who suspect their colleagues overestimate the tenacity of the public memory.

ONE thing does seem clear, that after these recent experiences with the Little Napoleons of Finance and the Don Quixotes of Reform the public will be glad, at least for a while, to entrust the electrification of America to craftsmen they can depend upon. These, as the general public knows, are the honest operators of honest utility businesses.

It is really a piece of good luck for the country that the utility business is in its present hands. For the real operators and administrators of the business are the enemies of the financial racketeers and messianic marauders who have almost put the industry on the rocks. Ten years ago the "Electrification of America" was a phrase to conjure with. Today the man who utters it is eyed askance, and if he bears any of the marks of a promoter of security speculation or a Messiah of the more abundant life, he is ignored. At least he should be. He is certainly ignored in the very business he professes to know all about, by the very men he professes to have for his closest friends.

These men are not interested in speculation nor in messianic theories. But they are passionately interested in the electrification of America. It may be a good thing at this point to have a look at them. They are not all cut out of the same pattern, of course. They have doubts, dubieties and differences among themselves. In the main they are in sound physical shape, for they have to work hard, physically and mentally. They are men of all types, executives, salesmen, mathematicians, scientists, white-collar men, dungaree men, Brain Trusters, Muscle Trusters. One thing they all have in common is an imponderable quality called "balance." This keeps them from being easily swayed or scared. Hence, they keep business going in spite of everything. It is part of their duty to keep it going in thunderstorms, floods, cyclones, fires and all sorts of disasters. Also, they must keep it going through debates in Congress, political campaigns, government investigations, public ownership drives and the back-firing pranks of well-meaning numskulls around a telegraph office.

THEY will fight anything to keep their service going and their business alive. Thus, at the moment, the two Boloney Roads to nation-wide electrification look more like battlefields than arteries of progress. On the road of the Napoleons of Finance there is a litter of prospectuses, crumbled trenches thrown up by legal sharps, wrecked "utility empires," fleeced speculators and impoverished widows and orphans. On the road of the Don Quixotes of Reform there remain the shell-holes of bureaucracy which "probed" and dug up nothing; the débris left by the winds of campaign eloquence; the cave-ins of the tunnels of political sappers. There are also what looks like old torn Congressional Records and the splinters of busted "yardsticks."

There is no way of telling how much farther the country would be today on the real road to electrification if it hadn't been for all this warfare. There is also no way of telling where the business would be if the men who run it hadn't fought to save it. You may think the power people ought not to take the government into court, ought not to make a constitutional issue of the power problem. But that is the way they feel about it. The

Electrification"

light and power man can't take a meteorological hurricane lying down and he can't take an economic hurricane lying down, either. Perhaps he ought to reason with the New Dealers, meet them in a spirit of give-and-take. He tried that, but found a political wind as hard to reason with as any other kind. His recipe for beating a storm that threatens to make hash of his service is to fight it. So that was what he did.

IT WAS good luck for the country that these men stood fast, because if they had been less stalwart fellows things would probably have been in a worse mess than they are. If any considerable number of them had been more interested in making huge sums of money in security speculation than in administering electric service, then the wreckage of so-called "utility empires" would be strewn from coast to coast instead of being confined to a few small areas. If many of them had been a little soft in the head about "the more abundant life," then the biggest building and the tallest skyscraper in every city, town and hamlet in the United States would soon be not the local bank or factory, but the local jail for delinquent taxpayers.

But they did not compromise nor retreat, and apparently have no intention of doing either in the future. They are eager to have done with the Washington Merry-Go-Round and to get back to the work they know how to do, and which, unless all signs fail, the country is ready to have them do without interference from boloney artists inside or outside the industry. This is the work of the electrification of America.

There are many ways of picturing the dawn of the glad day when this desirable goal is achieved. But the picture which most interests the simple American citizen is a picture of himself and his wife and family. No matter where he lives, he will have electricity in his home. It will be one of his most inexpensive housekeeping items. His wife will cook with electricity, sew with it, wash the dishes and the clothes with it. The family will have an electric refrigerator, an electric toaster, a radio, of course; a health lamp, little electric heaters in all the bedrooms for cold days in early fall and spring, and plenty of good bright lights for the children to study by. The cost of running them all will be less than the upkeep of his automobile.

THIS comfortably electrified American citizen works for a living, hence he will also be interested in seeing a picture of industry in America electrified. An electrified America means electrified transportation. Not many weeks ago, along the busy miles of steel rail between New York and Washington, there was a noticeable lessening of the black smoke pouring from the funnels of the locomotives, a subsiding of the white clouds of steam, a quieting of the noises of the trains. What had happened? The Pennsylvania Railroad had completed electrification of its service between the nation's metropolis and its capital. It had spent $68,000,000 in materials, wages and services. Well, in the electrification of America more than 200,000 miles of steam railroad are waiting to be electrified. Already the job has been done on 5,200 miles of it. On city streets are 31,500 miles of electric street railway, and where rail service in city streets is being lessened, the trolley bus, operated electrically, is taking its place. In larger cities subway extensions are being made. Diesel-electric locomotive units are being more widely used for switching and yard service and for high-speed passenger traffic on the railroads.

When this electrified American steps from his electric commuters' train, or his street car, subway train or trolley-bus, he will go to work in an electrified factory, store or office. The varieties of business he will go to work at are limited only by the possibilities of electricity, and these seem to be boundless. Scarcely a week passes without some new way being discovered of using electricity in industry. It is thus not only renewing old industries but creating new ones. It is not without competition from steam, gas, Diesel engines. But competition has always served to stimulate the power people, not discourage them. In anticipation of the coming electrification, they are already prospecting for new industries to be operated electrically. Thus, our electrified American, when he gets to work, may find himself doing anything from serving soup in an electrically air-conditioned restaurant to grinding grain in an electrical distillery.

AND when, because of happier living, easier work, more leisure and fewer worries, the electrified American stays so healthy that it bores him, he can give himself an electrical fever and spend a week in bed. This, of course, is spreading it pretty thick.

The utilities were already well on the way to the electrification of America. Detours, not of their own choosing, via the road of financial speculation and the road of public ownership, have delayed complete achievement. Now some of the toughest battles over these detours are behind them, but other battles lie ahead. One will be a battle to save holding companies where they are legitimately organized and perform a necessary public service. It was in the holding company field that the Little Napoleons of Finance did some of their most deadly work, smearing the name "holding company" with ill repute. But this fact remains that in many cases the holding company furnished and will continue to furnish the means of extending electrical services to remote localities that could not be reached by small individual companies. Holding company organizers transformed into effective electrical armies individual squads or platoons of operating companies that were powerless to extend service by themselves.

THE job is cut out for the trained and toughened power and light man, and it is no job for stock jobbers, witch doctors or children. If it is properly done it will put this country on its feet. If it is left in the hands of the experienced craftsmen who know what it is all about it will not merely *help* to bring back Recovery—it will *bring it back.* This job of the electrification of America will start a movement of no less than $16,500,000,000 in goods and services throughout this country. It will put more than 1,000,000 men and women back to work. It will add more than $2,000,000,000 to the payrolls of the nation.

This means not Boloney Electrification, but Real Electrification. The road is open, but troublemakers and meddlers ought to be kept out. On this road to the electrification of America there ought to be a large, peremptory sign every hundred yards or so, and it ought to read, "Caution—Men Working!" Then there ought to be cops to see that the tough guys obey the sign.

One of a Series of Intimate Talks with Industry Executives

Fuller on Super Power Plants

An Interview by

FRANK R. INNES

BIGNESS is under the microscope. With other phenomena in the advancing progress of civilization, the development of enormous business and industrial concentrations is being scrutinized today to see whether or not it has been carried too far. People have begun to question whether—in the public interest—the law of diminishing returns should not be buttressed with other laws against size and might.

Theodore Roosevelt's trust-busters started the movement in the field of business. Franklin Roosevelt's new dealers are now out crusading. But with delightful inconsistency, while they are sharpening their pruning shears for major operations on the management organizations of the privately owned power industry, which they call too large, they are building upon the Colorado, Tennessee and Columbia Rivers the greatest concentrations of electric power that the world has seen.

Questions large stations

With all political paradoxes aside, however, power men are wondering on how vast a scale these resources may be developed. Some engineers urge that prevailing practice has already gone further in size than can be economically justified.

One man who holds this view expressed his frank opinion to me the other day. And H. W. Fuller, vice-president in charge of engineering and construction of the Byllesby Engineering & Management Corporation, has a background and a record in the industry that makes his judgment worth attention. He said:

"We have gone too far, I believe, in concentrating generation in big plants, in building long, heavy lines for bulk transmission of power and, as must necessarily follow, in multiplying investment by calculating spare capacity in the large figures thus imposed. I believe that the economical and logical direction for further development is toward smaller power plants as close to individual load centers as it is possible to put them. Any man who builds super power plants remote from load centers, planning to transmit large blocks of energy over long distances, is going counter to the plain, common sense of engineering—no matter if he has the power of taxation to support him.

"Let's look at the big station in comparison with a group of small plants," he continued. "On the one hand are large generating units that in capital and operating costs show a saving over smaller machines. This was a fine argument back in the days when a pound and a half of coal per kilowatt-hour was an excellent performance and three pounds or so was the national average. But today the cost of fuel per kilowatt-hour is so small that the slight difference in efficiency between a small turbine and a big one is not very significant. And the capital cost of the small machine, per unit of capacity, is not so high that it need be a determining factor.

"In these days of invention and change it is not wise to freeze an investment for any longer time than is necessary; neither is it wise to put too many eggs in one basket. The money in a generating station cannot be got out except by use. Progress or change may make that use uneconomical. With smaller investments in smaller units it is easier and less costly to keep in step and to follow the changes and movements of load more closely.

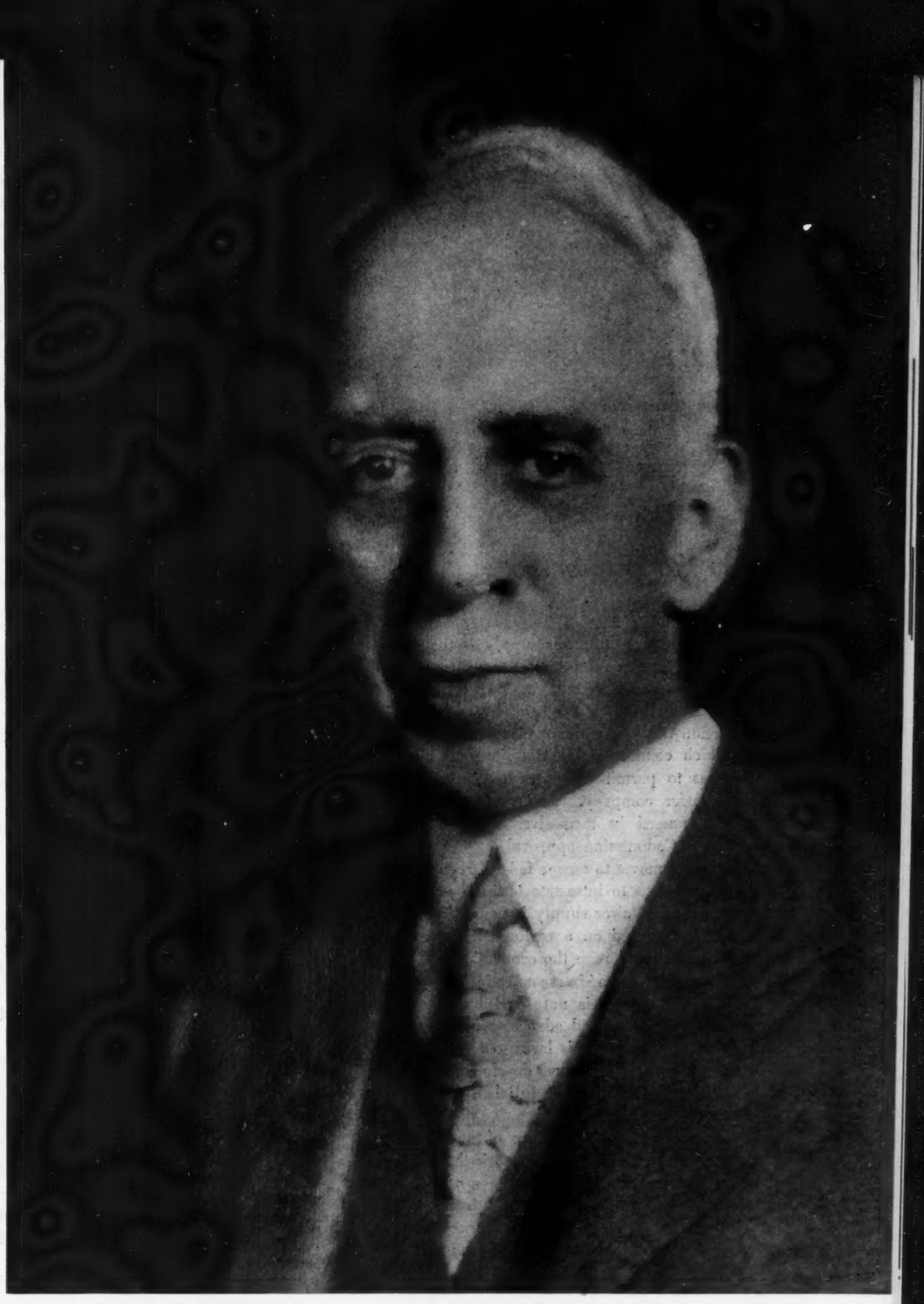
"Less spare capacity is needed as a reserve for a group of small plants than for one large one. In one system I know of 10 per cent of the capacity needed for the peak is used but 1 per cent of the time. Reserve capacity on that system amounts to about 30 per cent of the total. In effect, then, nearly one-third of the spare capacity is held in reserve against the failure of other capacity that is used 87 hours in a year.

"But with a number of smaller plants the condition is much different. Depending on the geography of the region served, the spare capacity would be in smaller units and smaller excess would be required. The total capacity of a system serving a peak load of 250,000 kw. with large stations, for example, might be 350,000 kw. installed, whereas with smaller stations advantageously located a total capacity of 300,000 kw. might be sufficient."

Mr. Fuller does not believe that the industry has provided too much power or that the present power systems are too extended. Rather, he draws a parallel with the manufacturer who used to build one enormous factory to supply the national market with all production centralized, and now locates smaller plants in the several market areas to save freight costs, quicken deliveries and safeguard against labor troubles. Engineers and executives of the public utilities must now likewise study the possibilities of decentralizing the power resources of the country to deliver kilowatt-hours more economically, and improve the service, to consumers.

Day of super power over

"To my mind," Mr. Fuller concluded, "the day of the super generating station, designed to deliver bulk power over long transmission lines, has passed, whether you talk of steam or water power. Except with multiple transmission lines over different routes, transmitted power cannot compare in reliability with local generation. Under the best conditions, it has a value that must be stated as something less than primary power."



HARRY WILLIAMS FULLER, vice-president in charge of engineering and construction with Byllesby Engineering & Management Corporation, speaks on the trend of development in electricity supply systems, from a background of more than 40 years' experience in building and operating them.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

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Follow the Economics of Power Supply

A SERIOUS aspect of power supply is the discontinuance of transmission across state lines in order to be free from federal regulation. Two utilities have already acted and others are studying possibilities. One suggestion is to have transfer companies at state lines in which connecting utilities have no financial control so as to permit of contractual arrangements with the transfer company. And these actions after the law has passed in themselves seem to require Federal Power Commission approval.

Any of these moves to escape federal regulation by restricting operations to intrastate business need to be studied with care. Power supply is usually most economical when arranged on a regional basis, and the public will and should reap the economic and service benefits that come from interconnection. The economics of power supply is not fixed by state lines. Enemies of the industry and advocates of government ownership will seize upon this lever to gain their ends should any widespread movement develop that restricts private utilities from giving the full benefits of interconnections to the public.

In the long run the economics of power supply must govern and the public will see to it that no regulation, state or federal, handicaps the application of this principle. Thoughtful utility executives will consider all aspects of interconnection before acting to restrict rather than to expand their interconnections.

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To Test the Utility Act

IMMEDIATE action to test the constitutionality of the holding company bill has been started in the United States District Court of Maryland. The American States Public Service Company claims that the act is unconstitutional. This company is in process of reorganization under the jurisdiction of this court within the provisions of the bankruptcy act. It operates several small electric, ice and water properties in several states, but does not do an interstate business.

It is evident that this company affords a good exhibit to bring out the legal features of the holding company bill. It is already under the jurisdiction of the court and in process of reorganization through the bankruptcy law and certain principles laid down by the court. The expense of registration, the abrupt dissolution of the company, the constitutional aspects of federal legislation on purely intrastate business and the services that a holding company can render several small properties more economically than each can act by itself will have an important bearing on the decision and introduce major elements of public interest.

Both the industry and the S.E.C. wish to have a prompt court decision on this bill. This test case, with the valid facts it brings forth and the able counsel employed, should enable the courts to act. The industry and S.E.C. cannot plan their operations and should not go to the trouble and expense of trying to carry out all of the provisions of the holding company bill until these legal decisions are rendered. Prompt action is desirable on this case, and this appears probable in that the case can be taken directly to the Supreme Court for review.

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Federal Aid on Rural Electrification

THE plans of R.E.A. have been developed slowly and soundly despite the political pressure for immediate action to spend the $100,000,000. Recent announcements indicate a business-like plan and procedure. Private utilities can apply for funds on rural projects with a minimum of red tape. The interest rate and the twenty-year amortization give an annual capital charge of 6.7 per cent; the credit of the utility is all that is needed, and spot checkers of R.E.A. will be used to keep in touch with operations. Some utilities do not wish to sign a twenty-year note with the government, and are able to finance their rural extensions at the same or lower cost than the R.E.A. terms. Others have negotiated with R.E.A. for funds. Apparently, however, the volume of private utility applications is small and progress in rural electrification, that is now very rapid, comes from the direct action of private utilities with their own money and plans. This is the thing to do.

But the major stumbling block in rural electrification lies in getting the farms equipped with appliances and wiring. Here the E.H.F.A. can be of great aid to all concerned and full advantage should be taken of this support. This is a direct negotiation with the farmer and introduces no negative policy relations

between the utilities and the federal agency. And beyond the direct financial aid in sales, E.H.F.A. is prepared to help in education and sales promotion. Sound rural electrification must fit into the management aspects of each farm. Electricity and electrical equipment must fit the income status, the production program and the entire farm operations. This involves education and agricultural management. The E.H.F.A. and the state agricultural extension divisions can aid greatly in this aspect of the program and should be called upon.

Rural electrification is no problem from the point of view of building extensions or giving minimum light and power service. The problem is a management problem on each farm in order to use electricity economically and intelligently for farm operations. Electricity must pay its way on a farm as in a factory.

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Steam Plant Problems Begin to Simmer

BENEATH the calm surface of central station capacity statistics in comparison with present loads a situation is beginning to develop which deserves early executive consideration. Outputs grow apace, and when the curves of kilowatt-hour sales are projected into the future the importance of planning for further capacity assumes a practical perspective on not a few local systems. Interconnection is only a partial answer at best, in view of the potentialities of the holding company law and its uncertain status in the highest court. Developments in steam turbine and other prime movers are bringing production economies within reach of many industrial plants which were unknown a few years ago. These signs of progress in power plant engineering are sharply significant from the competitive point of view and emphasize the desirability of surveying generating plans afresh in cases where expansion programs are incomplete or indefinite.

If facilities now available in the direction of improved steam turbine units, the mercury cycle, modernized boiler designs and piping in various single applications or in combination are utilized by industrial plants, some central stations will have to take steps to widen the margin in B.t.u. per kilowatt-hour between the optimum industrial practice and utility plant efficiency, in order to hold or secure marginal power business. In addition, early analysis of plant development possibilities will contribute to lower manufacturing costs, and in the long run toward stabilized or lower prices for equipment.

It is desirable to spread the demand on prime mover manufacturers which will originate in the comparatively near future if present trends continue. If manufacturers of prime movers, boilers and other heavy equipment are able to hold their organizations relatively intact, instead of being forced to try to reassemble expert engineering skill over a period of many months following partial dispersion of forces due to thin business, purchasers of such equipment will greatly benefit from the more stable condition hinted at above. Certainly the present is no time to shut one's eyes to the growth of loads and progress of prime mover designs for industrial and utility applications, if present business is to be held most effectively and future capacity and loads acquired most economically in this important field of energy sales.

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To Build Up the Range Load Fast

POWER companies are pretty generally agreed today that cooking load is not only desirable but vital—if lower rates and high expenses are to be carried. In many cities, where management for years has been apathetic toward the range, the go ahead has now been given. Selling has started and, with the decision made, the chief executive feels that he has done his part and the load will grow. He will be interested in studying the comparison of experience from nineteen companies presented in this issue.

If these data mean anything, and we think they do, the decision to sell ranges is not even a start. For it takes more than a good rate and free wiring and a trade-in allowance and advertising and home service to build a load. It takes more than salesmen and all the usual methods of promotion, unless the company is to be content with a small and slow accomplishment. Results, it seems, depend principally upon the scale and scope and speed with which these usual features of a sales program are organized and applied. Achievement comes not from methods so much as from the intensity with which the methods are applied. And in this word intensity one can measure the wide difference in the results that are reported from this group of companies.

True, the building of a range load must start from an executive decision. But too often that decision is incomplete. It is agreed that the company will go out after this waiting market for electric cooking, but the management fails to decide how fast this business is to be built up. It overlooks the fact that range load can only be secured to the measure of the money and the man-power that are provided. The marked contrasts indicated by the data in this comparison of nineteen cities are to a considerable extent a reflection of this intensity factor in selling. Where plans have followed through with personnel, promotion and the pressure of thorough organization and sales control progress has been made. But the rate of progress is something that you must buy with money and men and management in the marketplace.

· TRENDS ·

THE EDITORS USE A SPOTLIGHT
ON CURRENT HAPPENINGS

Get Together for Business Building

SEVERAL meetings between committees of the several branches of the industry to promote the electrical business are indicative of the need for joint action and of the feeling that the time is ripe for getting business. The utilities met with the contractors in Chicago in September, N.E.M.A. has appointed a business building committee, a joint committee is promoting wiring, joint committees are working on merchandising promotion and the wholesalers and leagues are working together. Unfortunately these movements are not yet co-ordinated or headed-up to a common center, and this step is necessary to get the best results. All branches of the industry have the same objectives in the markets and the efforts of the individual branches can be aided greatly by a joint or co-operative business promotion organization. Steps should now be taken to establish such a joint committee, composed of executives who will bring together the subordinate joint committees to study possibilities for acting together in business building in the several markets.

Black Committee Goes Fishing

TO ADD to the expense and harassment of the utilities the Black committee has sent its agents into holding company headquarters and, in addition, a most voluminous questionnaire has been sent to operating utilities asking detail questions on service contracts. The search of the files on lobbying activities is for political ammunition and the service questionnaire is to the same end, but is a needless and expensive duplication of the Federal Trade Commission investigation. These incessant fishing expeditions into the utility business simply handicap the progress of the industry in its goal to electrify this country. They take executive attention and add enormous cost burdens. It is the public that suffers and bears the burden of expense, and this fact is penetrating public consciousness. There is going to be a big backlash out of attempts to play political football with an industry so essential and so intimately associated with the comfort and prosperity of the nation.

To Register or Not

UTILITIES are studying the new holding company law and so is the S.E.C. with particular reference to the registration requirements. Close study of the provisions shows that the December 1 date for final registration is hedged about with ambiguous phraseology. Apparently the obligation is upon S.E.C. to pass upon the status of those who apply for registration or for exemption from registration. The burden of proof is upon S.E.C., and not upon the utility, to determine whether it comes under the provisions of the act and must register. Thus it is possible to claim exemption from registration until overruled by S.E.C. And the S.E.C. finds itself enmeshed in the preparation of registration forms, flooded with an influx of claims for exemption or registrations and the task of interpreting the law in individual cases. Under the conditions prompt action is impossible and the S.E.C. wisely decides to go slowly in putting the law into effect.

Barnum Never Died

WONDERS of electricity never cease, and it pays not to let the public lose sight of that. Proving the economies of electricity in exhibits and advertising is fine, but a touch of magic and romance is a shade better in keeping a kindly feeling in the breasts of the consumer. That's why, wholly apart from direct sales appeal, the National Electrical and Radio Exposition in New York just now is notable. When showmanship can concoct labels like "audible light," "sun motor," "bloodless electric surgery," "electric frisker," "artificial fever" and can display Lew White's tubeless and pipeless organ imitating an orchestra from piccolo to French horn, no wonder the ladies and gentlemen of the lay press stand agape at the preview. If they do, blasé as they are, what must these subtle marvels stir in the hearts of the mass of spectators?

Wiring Promotion Needed

SALES of electrical equipment to homes and farms still run up against the handicap of wiring. The industry made some progress in the old days, at least in spots, with wiring promotion, but these efforts ceased for several reasons. Wiring promotion is now an individual effort of manufacturers or of local groups, and instead of action to get adequate wiring and to promote the sale of wiring much time is spent in a fruitless discussion of the cost of wiring. The problem of the industry, as pointed out at the N.E.C.A. meeting in Chicago this week, is to sell wiring that is available, not to focus all attention on the development of new wiring that may or may not be cheaper and more satisfactory. A revival of joint industry efforts to promote wiring is in order if full advantage is to be taken of the sales opportunities for appliances and electrical equipment.

French Capital Is Shy, Too

CONDITIONS abroad react on our own prosperity. When they improve, trade barriers are lowered, commerce increases, the production of wealth is stimulated. Electric progress in France is therefore of interest. According to a recent article in "Electrical Foreign Trade Notes" the sum of 40,000,000,000 francs ($2,600,000,000) has been invested in the power industry up to this time. Growth, except as interrupted by the depression, has been rapid. The output, estimated at 7,000,000,000 kw.-hr. in 1923, more than doubled in seven years. Expressed in billions, it rose to 15 in 1930, fell to 13 in 1932, returned to 15 in 1934. Recovery has been more pronounced than in the United States. To permit nation-wide distribution of energy a 220,000-volt system is being built, capable of handling 3,000,000,000 kw.-hr. a year. Large water-power developments have been made. Steam plants, which supply 55 per cent of the total energy, have been rebuilt to operate at 1.3 lb. of coal per kilowatt-hour. Erection of a hydro-electric plant is stated to require five years and, in view of the difficulty of obtaining capital, unnecessary growth of plants is not anticipated. To Americans that statement has a familiar sound.

"Armed Neutrality" Established Between Utilities and S. E. C.

Utility officials agree to co-operate in drafting rules for administering new law — Joint statement issued after first conference — Court test on holding company act

Eleven officials of the leading public utility companies of the country met last Wednesday with the Securities and Exchange Commission in Washington with the result that the utilities will co-operate with the commission in working out the administrative policies set forth by the public utility act but will waive none of their constitutional rights. The joint statement issued on behalf of both the S.E.C. and the industry after the conference follows:

"The conference related to general questions underlying the administration of the public utility act and also to tentative rules and regulations concerning exemptions and registrations which the commission had prior to this time given to the utility industry for criticism. It was stated both by the commission and the representatives of the utility industry that any constitutional or other legal rights of the companies were not to be waived or prejudiced by this or subsequent conferences between the commission and representatives of the companies in their endeavors to work out together the problems involved in the administration of the act, nor would the commission by its registrations seek to bring about any waiver or prejudice of these rights.

"The representatives of the utility industry, subject to this understanding, indicated their willingness to aid the commission in the working out of the administrative policies set forth by the act, and to that end, a representative working committee of the utility industry is to be created to be available to the commission for consultation on such problems as may occur from time to time."

Representatives of the utility companies present included: Fred S. Burroughs, Associated Gas & Electric Company, Frank D. Comerford, New England Power Association; James F. Fogarty, North American Company; Daniel C. Green, Middle West Utilities Company; William J. Hagenah, Standard Gas & Electric Company; W. Alton Jones, Cities Service Company; Randall J. LeBoeuf, Jr., United Corporation, Niagara Hudson Power Corporation; S. W. Murphy, Electric Bond & Share Company; H. Hobart Porter, American Water Works & Electric Company; Garfield Scott, United Gas Improvement Company; Wendell L. Willkie, Commonwealth & Southern Corporation.

James M. Landis, one of the group of men who wrote the securities act of 1933 and the securities exchange act of 1934, was elected this week chairman of the Securities and Exchange Commission with the approval of President Roosevelt, after this selection had been strongly advocated by Joseph P. Kennedy, the retiring chairman.

Initiating the first court action against the public utility holding company act of 1935, a suit was filed September 16 in the U. S. District Court at Baltimore, Md., by J. B. Whitworth and F. Donald Fenhagen, trustees for the American States Public Service Company. Power companies in eight states, according to the petition, are owned or controlled by the company, which has its principal place of business in Baltimore, although incorporated in Delaware. John W. Davis, counsel for the Edison Electric Institute, left for Baltimore last week, where he will act as counsel for Fred Lautenbach, an intervening petitioner, who also is seeking to have the act declared unconstitutional.

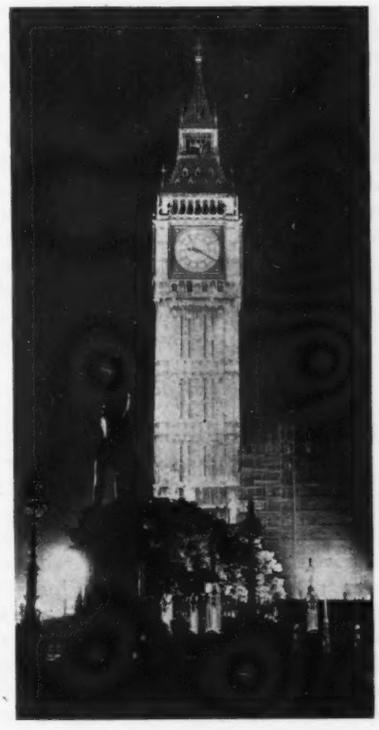
American States Public Service Company is in process of reorganization under the federal bankruptcy act. Two plans submitted for reorganization contemplate the formation of a new company which would acquire and own securities of the various companies now controlled by the Delaware corporation. It was contended, however, that the new holding company act's requirements regarding registration and filing of statistics and other information concerning the utility companies would make it necessary for the petitioners to expend out of the estate "substantial sums of money . . . to the detriment of the estate." It was also pointed out that if the trustees fail to register by December, according to the act, they will be subject to a fine of $10,000 and to imprisonment of two years, or both.

In conclusion, the petition asked the court to determine the constitutionality of the act, and "based upon such determination, issue proper instructions to your petitioners to guide them in performing their duties in the handling, management and conservation of the trust estate committed to their care, including particularly instructions concerning disbursements of moneys out of the trust estate in furtherance of a plan for reorganization and for registration." Hearings opened late this week.

New York Power & Light Company has cut its interconnection with the New England Power Association in a move to free itself from provisions of the public utility bill. The power line ran between Troy, N. Y., and North Adams, Mass., and enabled many economies which favored power and light consumers in New York and New England.

Three subsidiaries of the Associated

LONDON IN FESTIVE ARRAY



Many of London's famous buildings were floodlighted in celebration of the annual conference of the Association of Public Lighting Engineers, which opened early in September. The illustration shows Big Ben floodlighted.

Gas & Electric System have filed applications with the Federal Power Commission for authority to sell their properties to the New York State Electric & Gas Corporation, a fourth subsidiary of the same system, to avoid coming under the interstate commerce provisions of the holding company act. The Elmira Light, Heat & Power Corporation, Empire Gas & Electric Corporation, New York Central Electric Corporation are the companies involved. Two other subsidiaries of Associated, Northern Pennsylvania Power Company and the Metropolitan Edison Company, filed a similar application with the commission a few days after the new act became effective.

A searching investigation as to the manner and method of "servicing" contracts between holding or servicing companies with operating units in public utility systems is being conducted by the special Senate committee appointed to investigate lobbying activities for and against the passage of the public utility act of 1935.

John J. O'Brien, president of Standard Gas & Electric Company, announces that the company has sold to operating companies in its system, and without profit to it, the stock of Byllesby Engineering & Management Corporation, all of which has heretofore been owned by Standard Gas & Electric Company. The sale of this stock to the operating companies in the Standard Gas & Electric Company system has been made to carry out the spirit of the recently enacted federal public utility act of 1935, various state legislation and the decisions of certain state regulatory commissions.

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New York Utilities Fight Power Plant Vote

Legal action along two lines has been begun to prevent a referendum on the proposed municipal power plant for New York City at the coming election. On petition of Edward J. Tierney, assistant treasurer of the New York Edison Company, Inc., Justice Hofstadter of the Supreme Court signed an order to the Board of Elections to show cause why a peremptory mandamus should not be granted directing the board not to print the proposition for the municipal plant on ballots and sample ballots.

A complaint was served on Corporation Counsel Windels in a suit by the New York Edison Company, Inc., as a taxpayer, for an injunction directed against Mayor LaGuardia, Comptroller Taylor, City Chamberlain Berle and City Clerk Cruise, to prevent the spending or advancing of any money of the city of New York in connection with the referendum or the taking of any action or proceeding under the authority of the local law, which undertakes to provide for the municipal power plant.

Supreme Court Test of T.V.A. Expedited by Federal Government

Files memorandum agreeing to review by high court — Seeks to have doubts on constitutionality cleared — Brief argues proprietary business not prohibited by Constitution

Believing that a Supreme Court ruling will set at rest doubts expressed on constitutional grounds as to the right of the Tennessee Valley Authority to carry out phases of its power program as required by mandate of the Congress, the government will not oppose a review by the high court of a suit testing the validity of T.V.A.'s power policy. The announcement of the government's position was made in a memorandum filed with the Supreme Court by Solicitor-General Reed and T.V.A. lawyers "for the purpose of aiding the court" in the suit of George Ashwarder and others against the T.V.A.

The suit in which a decision against the T.V.A. by a Federal District Court (the famous Grubb decision) was reversed by the Circuit Court of Appeals in New Orleans involves the T.V.A. right to sell surplus power generated at Wilson Dam and to buy from the Alabama Power Company transmission lines emanating from Wilson Dam. Petitioners have sought to broaden the suit into a general test of the constitutionality of T.V.A., but the government is opposing this effort. Although the government did not oppose the petition by minority stockholders in the Alabama Power Company for a Supreme Court review of the Circuit Court decision, it did raise the question of the minority stockholders' right to bring the suit. The government argued that this was the first time that minority stockholders, without showing fraud or damage, had been allowed to attack the validity of a contract entered into by their company.

Limitations denied

Defending the purchase of transmission lines and the sale of surplus power, the government's memorandum asserted: "The suggestion of petitioners that the right of disposition enjoyed by the federal government does not include all the power created by the dam, but is limited to such power as is created by waters manipulated for navigation alone, is a limitation nowhere suggested in the cases and obviously inconsistent with any real power disposition. . . . There is no force in petitioner's contention that the generation, sale and transmission of electrical energy constitutes 'proprietary business' commercial in character, and therefore beyond the permissible functions of the federal government. The Constitution no more prohibits the federal government from engaging in a proprietary business than it forbids the creation of a corporation to conduct a banking business; neither is an end in itself, but each may be the means for reaching a legitimate end."

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President Roosevelt Revamps Work-Relief Program

Differences of policy between Secretary of the Interior Ickes and Harry L. Hopkins, Works Progress Administrator, were settled last week at a series of conferences called by President Roosevelt at Hyde Park, N. Y. The controversy between Secretary Ickes and Mr. Hopkins arose when the latter ruled out projects already approved by the former on the ground that they involved too much cost for materials in relation to the amount of money that would be paid out in direct wages to labor.

As a result of the conferences, the work-relief program has been revamped. The W.P.A. received an additional $800,000,000 intended to stimulate its campaign to shift 3,500,000 persons from relief rolls by November 1. This executive order of the President's increased by $800,000,000 the $900,000,000 earmarked in the $4,800,000,000 work-relief act to be expended for loans or grants, or both, for projects of states, territories, municipalities and self-liquidating projects of public bodies thereof. Under Administrator Hopkins, it is expected that most of these projects will be financed wholly or in major part by federal grants, in contrast with the requirements under Administrator Ickes's P.W.A. program that the local or state agencies furnish 55 per cent of the cost by borrowing either from the federal government or from private sources. P.W.A. will get only $200,000,000 more for new projects under the revised set-up.

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Power Conference in U. S.

The International Executive Council of the World Power Conference, London, has accepted the invitation of America to hold the World Power Conference in the United States next year. Invitations to send representatives are being sent to all nations by the Department of State in the name of President Roosevelt. The meeting will be held September 7 to 12 in Washington.

Utilities Discuss E.H.F.A. Loan Terms

Financing of electrical equipment and appliances considered at Washington conferences — Massachusetts rural survey completed

Terms upon which the Electric Home and Farm Authority shall finance the purchase of electrical equipment and appliances and plumbing equipment were discussed with representatives of the public utility and sanitary industries at recent conferences in Washington.

The questions upon which representatives of these industries expressed their views, and which will be decided in the near future by the board of trustees of the authority, include the length of time to be allowed for repayment of loans, the rate or rates of interest to be charged and the responsibility of the several parties to each financing transaction. This last question has special reference to what liability, if any, shall be assumed by each of the following groups: Appliance and equipment dealers, distributors, manufacturers, and utility companies.

Users of electricity in urban and rural areas whose purchases of appliances and equipment are financed by the authority will make payments on their loans monthly. The authority will not lend directly to the users, but will purchase individual contracts from the dealers. Financing facilities will be made available for appliances and equipment of standard quality and low cost.

The utilities were represented by Hudson W. Reed of the United Gas Improvement Company, W. W. Freeman of the Columbia Gas & Electric Company, Mr. Austin of the Philadelphia Electric Company and H. P. Hardwick of the Commonwealth & Southern Corporation.

With the purpose of chronicling the progress of the rural electrification movement, the Rural Electrification Administration will issue monthly a news bulletin, which will help to inform the public of the development of R.E.A.'s projects, policies and publications. The first bulletin, dated September, 1935, has already been released.

In spite of the fact that only about 1 per cent of the inhabitants of Massachusetts are now beyond the reach of existing electric lines, the potential market for material, labor, equipment and appliances in the rural areas still to be served by power systems totals $2,024,549 in distribution extensions, $730,760 in wiring installations for new rural customers and $614,370 in household and farm conveniences. According to a statewide survey by the F.E.R.A. just made public under J. W. Young, director, the initial annual revenue to be derived from the sale of energy to 5,474 potential customers totals $215,847 on a consumption basis of 590 kw.-hr. per customer. This applies to 1,168 miles of distribution lines costing from $1,400 to $2,000 per mile, including transformers and services. The survey, which began last winter, reveals a total of 11,401 prospective customers located on 3,383 miles of unelectrified roads.

Based on replies as to the appliances the prospect would purchase and install during the first year of rural service (5,474 prospects), 84.5 per cent favored radio sets, 33.5 per cent water pumps for household use, 30.2 per cent washing machines, 24.1 per cent electric refrigerators; 7.1 per cent all-purpose motors, 1.8 per cent electric ranges and 0.7 per cent electric water heaters. The market value of the above appliances is as follows: Radios, $116,000; water pumps, $126,000; washers, $82,750; refrigerators, $175,750; ranges, $11,900; water heaters, $2,870; all-purpose motors, $25,300. The survey reveals a striking lack of appreciation on the part of rural prospects in Massachusetts of the usefulness of electric ranges and water heaters, and even refrigeration for the home has a long way to go before country dwellers become fully aware of its value.

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San Francisco Considers Plans for Hetch-Hetchy

Further conferences with Secretary of the Interior Ickes regarding partial distribution of Hetch-Hetchy power as the result of his order declaring illegal the existing agency contract between San Francisco and the Pacific Gas & Electric Company will be attempted by officials of San Francisco.

Plans under consideration include leasing a portion of the private utility's distribution system, leasing or condemning the entire system serving the city, issuance of revenue bonds for purchase of a portion of the system or construction of a competing system, or construction of the Red Mountain Bar hydro plant, a transmission line from Newark and a partial distribution system.

In a statement to the city outlining the attitude of the Pacific Gas & Electric Company, P. M. Downing, vice-president and general manager, suggested that the city request the United States Attorney-General to invoke a suit testing the legality of the present arrangement as provided for in the Raker act.

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New Boulder Dam Stamp

In commemoration of the completion of Boulder Dam the Post Office Department will issue a special 3-cent postage stamp. The stamp, which is to be the same size as the Special Delivery issue and arranged vertically, will first be offered for sale at the post office in Boulder City on September 28, and at post offices throughout the country starting September 30. Inclosed within a double line border, the stamp is to be printed in purple ink and will have as its central subject a view of Boulder Dam reproduced from an airplane picture taken at a low altitude, showing the Colorado River gorge both above and below the construction line.

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Columbia Valley Authority Opposed by Residents

That residents of the Inland Empire do not want a Columbia Valley Authority established to control development in the Columbia River drainage area was the consensus of opinion expressed at an informal hearing held recently by the Pacific Northwest Regional Planning Commission, of which Marshall Dana of Portland is chairman.

More than 100 persons from various communities of eastern Washington and northern Idaho attended the hearing and, almost without exception, they were opposed to the establishment of the authority, although T. A. Walters, First Assistant Secretary of the Interior, declared such a move was being seriously considered by President Roosevelt. The opinion was expressed that a co-ordinating rate fixing agency would be necessary to allocate power from Grand Coulee and Bonneville at a cost that would attract industries to the region. Dean E. C. Johnson of Washington State College advocated concentrating the power output for agricultural purposes. Dean Crawford of the University of Idaho declared that a "Columbia Valley Authority would be going too far. It is not needed."

Strong opposition to government projects was voiced by members of the Idaho delegation. Lieutenant-Governor C. P. Mix of Idaho was opposed to the increase in agricultural production which would follow the irrigation of the arid acres of the Columbia Basin.

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Utility Investors Group Expands Program

Expansion of the American Federation of Utility Investors to cover all recognized American industry has been announced by Dr. Hugh S. Magill, president of the organization. In conformity with the change in field the word "Utility" will be dropped from the official title of the body, which will be known hereafter as the American Federation of Investors. The federation took a prominent part in fighting the enactment of the public utility holding company act of 1935.

New Products Disclosed at Iron and Steel Meeting

Speeds in strip production have increased 30 per cent, higher power has been applied to wider and wider rolling and new run-out table schemes have been adopted incidental to the doubling of strip output capacity which took place in the steel industry in 1934. Five out of every six horsepower added last year was for strip production, raising the question whether the steel industry was not outstripping its strip and sheet market. But Stephen Badlam assured the attendance at the annual convention of the Association of Iron and Steel Electrical Engineers at Pittsburgh this week that the 9,000,000 tons of current annual capacity would more than be absorbed when the consumption reaches what is indicated to be normal for the rapidly growing market already created.

W. H. Burr of Lukens Steel recounted a glowing number of technical advances and indicated that schemes for rolling strip directly from molten metal were nearing the stage of practicality. On the counter side the continuous processes have been perfected for pickling baths and for gaging and size-sorting so that end-trimming, stitching of successive lengths and stacking have become practicable, largely due to the quickened functioning possible in electronic control equipment. Thyratron-tube driver recorders are also being used in conjunction with fixed focus radiation thermo-tubes to record steel temperature differences in process stages as rapidly as one a second.

Companion papers by General Electric and Westinghouse engineers discussed the inherent performance characteristics of normal and high-torque induction motors in substantiation of the trend toward 3 to 1 frequency range as a means of accelerating and breaking run-out table motors with minimum loss of minimum capacity of motor-generator sets and motors.

In his keynote executive address Arthur H. Young, vice-president of the United States Steel Corporation, gave a tolerantly phrased Jeremiad against the "isms and ologies" of the current political situation. Exhibitors participated in the equipment exposition to an extent 40 per cent in excess of last year and many new products of an electrical nature were disclosed for the first time. G. R. Carroll of Jones & Laughlin is the new president.

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Installations Cost Cut Advocated by Contractors

"So far the building trades have felt no measure of recovery," said L. E. Mayer, in reference to the F.H.A. program, in his opening address as president at the convention of the National Electrical Contractors Association in Chicago this week. And to the contractors who join with voices raised in utility criticism, F. T. Langford said: "If you agree with them that the bill is too high, you are driving business right out the front door." Highlight of address by R. M. Walker was his assertion that the contractor faces extinction on account of the availability of low-cost materials to amateur wiremen and direct sales by jobbers' salesmen and manufacturers' agents to industrial plants and business houses. After a protracted discussion, the convention voted to table consideration of a new constitution and by-laws that had been prepared and planned for adoption at this meeting.

The contractors' biggest enemy is the man from whom he buys his material, said Mr. Walker, speaking on "proper differentials between contractors and consumers." The contractors have missed their opportunities in the past. They have been too busy fighting each other. Mr. Walker's remedy for this deplorable condition lies in contractor organizations such as have been set up in his state of Georgia, associations that by joint action can demand and get consideration. He pleaded for a stronger national association capable of effective action so that manufacturers will be enabled to set and maintain consumer prices that will include adequate return to the contractor.

After stating the contractors' recognition of the need for new wiring devices and materials, Earl Peak read the following resolution drafted by the executive committee: "The National Electrical Contractors Association declares its policy to be the extension of electrical service to the greatest number of users, and to this end the association believes that every effort should be made to reduce the cost of electric installations through developments in wiring methods and installation practices consistent with the safety and convenience of the public, which must be safeguarded at all times."

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Maryland Utilities Meet Aboard "City of Baltimore"

The Maryland Utilities Association met September 12-14 and enjoyed business sessions and a cruise to Jamestown and Yorktown. Joint meetings were held by the utilities, gas and transportation groups.

At the utilities meeting R. Paul Smith gave a notable address on the present tasks facing utility men. He pointed out that the intimate relations with customers and communities served must be regained. The size of the utilities, their reputed prosperity and the acts of a few members had made them vulnerable to political attacks in recent years. It was necessary to render service today on a basis that would make the utilities regain their standing in the several communities served and all employees and executives were under obligation to maintain the good name of the industry through their acts.

A review of the business outlook for the utilities was presented by L. W. W. Morrow. He stated that recent reports from the field indicated a general upturn in business that promised to continue. In addition there has grown up an improvement in local public relations and a cessation of anti-utility state legislation that argues well for the future. But Mr. Morrow pointed out that it was necessary to render better service, personalize the company and increase sales as a general program if the utilities hoped to regain prosperity and full public favor. Despite certain unbalances in national affairs and a present false philosophy of the relations of government to business the opinion was expressed that the peak of the utility troubles have passed and that the industry is on the up-grade.

Rural electrification was discussed at a round-table meeting after an address by I. L. Craig. Mr. Craig traced the growth of this movement, the several plans used to get the business and the details of the plan used in Pennsylvania so successfully. He advocated the use of this type of plan in Maryland and the appointment of a co-operative committee.

COMING MEETINGS

International Association of Electrical Inspectors — Southern section, Asheville, N. C., September 30-October 2; Eastern section, Boston, Mass., October 7-10. Victor H. Tousley secretary-treasurer, 612 N. Michigan Avenue, Chicago, Ill.

American Welding Society—Fall meeting, Palmer House, Chicago, Ill., September 30-October 4.

Empire State Gas and Electric Association — Annual meeting, Westchester Country Club, Rye, N. Y., October 4-5. C. H. B. Chapin, Grand Central Terminal, New York City.

National Electrical Manufacturers Association — Annual meeting, Palmer House, Chicago, Ill., October 7-11. W. J. Donald, 155 East 44th Street, New York.

Electrochemical Society—Fall meeting, Washington, D. C., October 10-12. Colin G. Fink, secretary, Columbia University, New York.

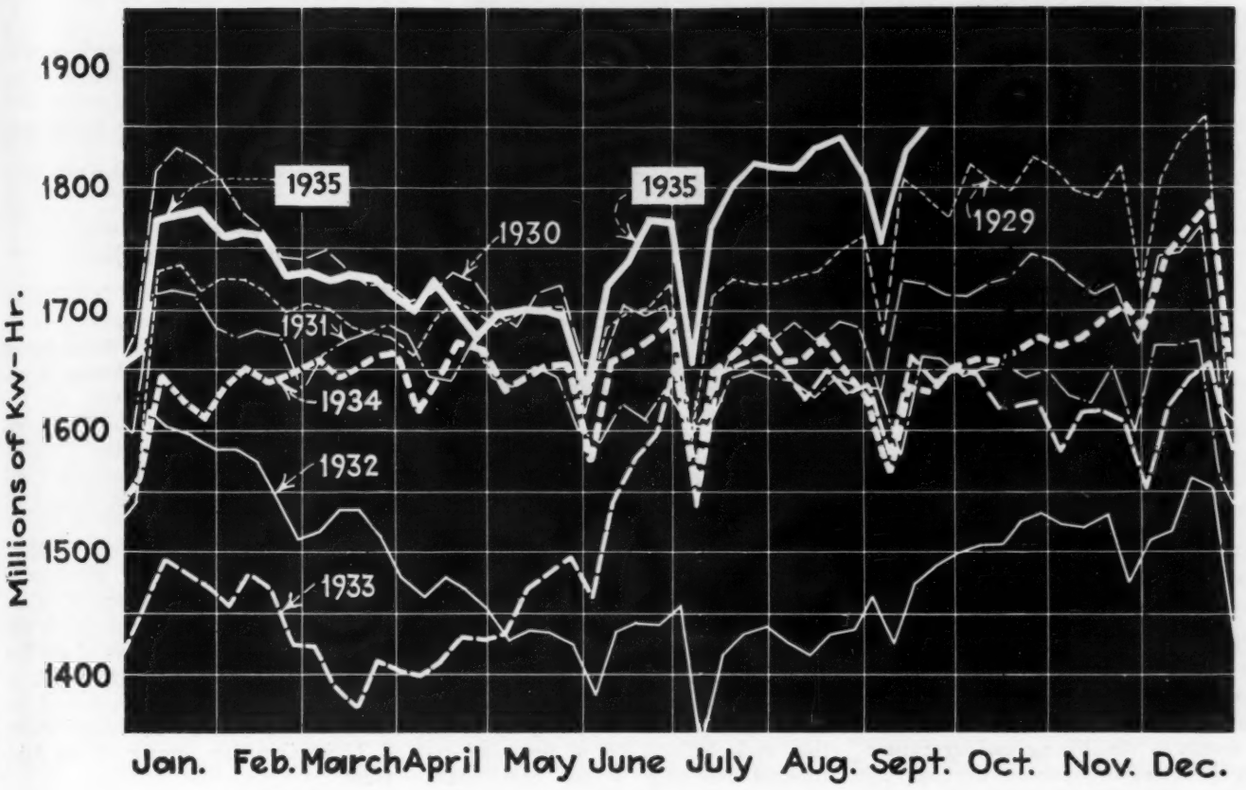
National Association of Railroad and Utilities Commissioners—Annual convention, Nashville, Tenn., October 15-18. John E. Benton, general solicitor, 806 Earle Building, Washington, D. C.

National Electrical Wholesalers' Association—Annual convention, Chicago, Ill., October 14-18. E. Donald Tolles, managing director, 165 Broadway, New York.

National Safety Council—Annual safety congress and exposition, Louisville, Ky., October 14-18.

American Institute of Electrical Engineers—Great Lakes District meeting, Purdue University, West Lafayette, Ind., October 24-25. H. H. Henline, national secretary, 33 West 39th Street, New York.

Output Near All-Time Record



Exceeding last year's figure for the equivalent week by 13.5 per cent, the production of energy by the light and power industry during the week ended September 21 broke all records for any week with a single exception. The total as announced by the Edison Electric Institute was 1,851,541,000 kw.-hr. This was 3.3 per cent more than in the like period of 1929 and missed the winter peak of that year by less than 0.5 per cent. The moderate rise over August, following the substantial up-swing that set in three months ago, would seem to indicate that the industrial demand is holding at the higher level thus attained and is being supplemented by the gradually increasing consumption for lighting normal at this season.

In the Rocky Mountain states, where much energy is used for mining, the gain over the preceding year has been consistently growing since last October. It has now risen to 48 per cent. Other regions show important gains, those in excess of 15 per cent being the South, New England and the Central industrial area.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
Sept. 21...1,852	Sept. 22...1,631	Sept. 23...1,639
Sept. 14...1,828	Sept. 15...1,634	Sept. 16...1,663
Sept. 7...1,752	Sept. 8...1,565	Sept. 9...1,583
Aug. 31...1,810	Sept. 1...1,627	Sept. 2...1,637
Aug. 24...1,840	Aug. 25...1,648	Aug. 26...1,630
Aug. 17...1,833	Aug. 18...1,674	Aug. 19...1,650

Per Cent Change from Previous Year

Region	Week ended Sept. 21	Sept. 14	Sept. 7
New England	+16.8	+16.8	+12.5
Middle Atlantic	+ 6.3	+ 6.0	+ 8.0
Central Industrial	+15.8	+13.2	+12.7
West Central	+10.2	+11.2	+10.5
Southern States	+17.3	+15.1	+13.4
Rocky Mountain	+48.0	+44.0	+44.2
Pacific Coast	+ 8.6	+ 7.7	+ 6.7
United States	+13.5	+11.9	+12.0

Santee-Cooper Project Declared Constitutional

In an opinion handed down this month the Supreme Court of South Carolina held constitutional and valid the act creating the $37,500,000 Santee-Cooper power project in Charleston County. The action was brought by Frank K. Clarke, a taxpayer, who challenged the constitutionality of the act on thirteen counts (ELECTRICAL WORLD, August 3, page 48). In passing upon an allegation that the project would compete with existing utilities, the court ruled that "the only kind of competition that the courts can restrain is unlawful competition." The court found no unlawful competition provided for in the act or contemplated by the South Carolina Public Service Authority.

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Central Valley Project

Approval by the President of an allotment of $20,000,000 to the Bureau of Reclamation, Interior Department, for construction of the first units of the Central Valley project in California has been announced by Harold L. Ickes, Secretary of the Interior and Administrator of Public Works. The Central Valley project, a comprehensive program for the conservation of the waters of the San Joaquin and Sacramento River basins in central California, was designed by the State of California and the bureau at an estimated cost of $170,000,000.

Utility to Reduce Board

At the annual meeting of stockholders to be held on October 9 the Electric Bond & Share Company will submit a proposal to reduce the board from fourteen to nine members.

New York Metal Prices

	Sept. 11, 1935 Cents per Pound	Sept. 25, 1935 Cents per Pound
Copper electrolytic	8.50*	9.00*
Lead, Am. S. & R. Price	4.35	4.50
Antimony	12.50	14.00
Nickel ingot	35.00	35.00
Zinc spot	4.60	5.124
Tin Straits	48.50	48.875
Aluminum, 99 per cent	19—21	19—21

*Delivered Connecticut Valley.

Utility Stocks Hold Ground

Electric light and power stocks maintained their position with relatively few significant price changes. "Electrical World" index 29.0; last week, 29.7.

American Water Works Unit to Offer Merger Plan

Stockholders of the Monongahela West Penn Public Service Company will be asked on October 11 to approve a merger with the company of three other public utilities operating in the state as a means of simplifying and strengthening the financial position of the company. Monongahela West Penn Public Service is a subsidiary of the American Water Works & Electric Company. The merger plan would absorb the Kanawha Traction & Electric Company, Spencer Water & Ice Company and Monongahela Water & Electric Company. All these organizations are West Virginia corporations, owning public utility properties located principally in that state. Certain properties in Ohio owned by the Kanawha company may be segregated into a wholly owned subsidiary in that state.

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Boston Edison Stock Issue; Other Utility Offerings

Directors of the Edison Electric Illuminating Company of Boston at a special meeting held September 16 recommended that the stockholders authorize an issue of new stock to retire $16,000,000 of short-term debt now outstanding. The stockholders will attend a special session on October 7 to consider the recommendation. The decision of the stockholders is subject to review by the state Department of Public Utilities.

Marking the final step in the refunding program of the Southern California Edison Company, Ltd., offering was made last week of $30,000,000 first and refunding mortgage bonds, series of 4s due in 1960, and $27,500,000 of serial 2½, 3½ and 3¾ per cent debentures.

Offering was made this week of $19,172,000 of first lien and unifying mortgage bonds of the Consumers Power Company, carrying 3½ per cent interest, due in 1965, and priced at 99 and accrued interest. Proceeds will be used for refunding and for improvements and additions to the company's property.

Pacific Gas & Electric Company issued this week $20,000,000 of first and refunding mortgage 4 per cent bonds priced at 102. This financing brings to $95,000,000 the total first and refunding mortgage 4 per cent bonds of Pacific Gas & Electric placed on the market since last spring.

Detroit Edison Company made an offering of general and refunding mortgage bonds, series F, 4 per cent, due in 1965, totaling $49,000,000. The bonds were priced at 103½.

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New Company Organized for Washington Project

The Columbia Electric Development Company has been incorporated in the state of Washington with headquarters at Longview, to build and own a portion of the new 66,000-volt tie line between the Ariel plant on the Lewis River and the system of the Washington Gas & Electric Company at Longview. (ELECTRICAL WORLD, August 17, page 77.)

The company is capitalized at $100,000 and on its board of directors is R. T. Smalley, vice-president of Washington Gas & Electric Company. It will build approximately 9 miles of the line from a point near Kalama, Wash., to Longview. The other 16 miles of the tie line will be built by Inland Power & Light Company, owner of the Ariel plant.

Current Earnings Reports

Operating Companies

	1935	1934
Alabama Power (Year to July 31)		
Gross earnings	$16,068,591	$15,527,905
Net balance	630,506	529,240
Detroit Edison (Year ended August 31)		
Gross earnings	46,966,087	44,297,874
Net balance	5,854,316	7,051,988
Duquesne Light (Year ended July 31)		
Gross earnings	25,585,772	25,071,129
Net balance	9,933,479*	10,259,090*
Georgia Power (Year to July 31)		
Gross earnings	22,733,298	22,194,549
Net balance	1,320,436	1,285,253
Kansas City Pwr. & Lt. (Year ended July 31)		
Gross earnings	15,268,124	14,517,367
Net balance	3,418,840*	3,255,760*
Montana Power (Year ended July 31)		
Gross earnings	10,450,723	8,778,732
Net balance	1,488,759	171,739
New Orleans Pub. Serv. (Year ended July 31)		
Gross earnings	15,127,005	14,974,226
Net balance	184,548†	243,875†
Penn. Pwr. & Lt. (Year ended July 31)		
Gross earnings	34,429,109	33,800,573
Net balance	4,641,675	5,455,692
Puget Sound Pwr. & Lt. (Year ended July 31)		
Gross earnings	13,553,970	12,967,145
Net balance	1,404,925†	1,511,129†
Tenn. Elec. Pwr. (Year to July 31)		
Gross earnings	12,705,006	12,193,392
Net balance	362,557	479,317
Virginia Elec. & Pwr. (Year ended June 30)		
Gross earnings	15,186,507	14,898,328
Net balance	1,527,301	1,523,908

Holding Companies

	1935	1934
American Pwr. & Lt. & subs. (Year ended July 31)		
Gross earnings	$80,012,740	$74,407,124
Net balance	6,233,835	3,188,094
American Wtr. Wks. & Elec. & subs. (Year ended July 31)		
Gross earnings	46,646,835	45,141,959
Net balance	1,601,778	2,188,516
Columbia Gas & Elec. & subs. (Year ended June 30)		
Gross earnings	78,956,717	77,000,532
Net balance	3,021,935	5,499,075
Commonwealth & Southern & subs. (Year ended July 31)		
Gross earnings	117,628,321	113,209,230
Net balance	873,668†	616,857†
Electric Pwr. & Lt. & subs. (Year ended July 31)		
Gross earnings	76,024,484	71,597,774
Net balance	200,294†	775,194†
Engineers Pub. Serv. & subs. (Year to July 31)		
Gross earnings	45,066,010	43,429,413
Net balance	1,349,807†	1,478,585†
National Pwr. & Lt. & subs. (Year ended July 31)		
Gross earnings	71,795,534	70,818,448
Net balance	6,082,089	6,811,606
Philadelphia Co. & subs. (Year ended July 31)		
Gross earnings	47,245,352	47,448,537
Net balance	7,167,123*	8,025,850*
Public Service Corp. of N. J. & subs. (Year ended July 31)		
Gross earnings	119,767,050	119,357,688
Net balance	24,339,991*	25,901,370*

*Available for all dividends. †Deficit.
Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

MANUFACTURING AND MARKETS

Favorable Business Items

Utilities finance $100,000,000 at low rate.
All trade indicators on upgrade.
War threat increases credit pressure.
Electrical sales increase in all lines.
Many industries announce modernization.

Unfavorable Business Items

Coal strike affects power output temporarily.
Threat of war shakes stock market.
Utilities busy with laws and regulations.
Utilities slow on heavy commitments.
Cost of living advances steadily.

Jones Predicts New Peaks for Electrical Industry

In an address delivered at the Waldorf-Astoria Hotel, New York, to the executives of the companies exhibiting at the National Electrical and Radio Exposition Frank C. Jones, president National Electrical Manufacturers Association, predicted that in 1935 consumption of electric energy would equal, or pass, the all-time peak of 1929. He went even further in his prediction when he said: "And 1936 will create a new peak and will start the revival of capital goods purchases by the utilities during 1936. . . . I predict that in 1937 the electrical industry, in all its branches, will attain complete recovery. . . . that by 1938 or 1939 the electrical industry will have the greatest volume of business in its history, far surpassing all our past peak volumes."

Attacking the New Deal experiments, Mr. Jones said: "Our difficulties and perplexities have been increased by the unparalleled experimentation of our present federal Administration; by its 'football plunges' in one direction and then in another; by its apparent hatred of all business and industry, and by its continual harassing, through many needless and unending reforms, of the very business and industry that still feeds, clothes and shelters more than five-sixths of the population—to say nothing of supplying a large part of the taxes and capital for its experiments and the relief of the unemployed.

"To have survived all this, superimposed on top of a great world-wide economic depression, proves the inherent, bedrock strength and soundness of our industry, and should give us the courage to face and surmount any obstacles that may be in our future path. . . . The light and power utilities have been particularly singled out for persecution by the present federal Administration, which has attacked them from every conceivable angle. . . . But let me say this, by these attacks, and their unrelenting viciousness, the present federal Administration and its local imitators have quite unwittingly 'sold' the use of electricity to the entire country. They have made every man, woman and child in this great land of ours more 'electricity conscious' than could have been accomplished by a twenty-year advertising campaign. . . ."

Extensive and complete displays of the last developments in radios and domestic electric appliances marked the 1935 National Electric and Radio Exposition held at Grand Central Palace, New York City, from September 18 to 28. Sponsored by the Electrical Association of New York, the exposition was aimed to present to the "man on the street" a comprehensive picture of the facilities available for entertainment, home lighting, air conditioning and modernizing the home with electric appliances.

The 95 exhibitions were about equally divided between radio dealers and manufacturers of electrical appliances. Conspicuous in all radio exhibits was the general trend away from the midget sets with their limited tone and wave band. New and larger cabinet models featured the new all-metal tubes and a wide reception band. Several model kitchens displayed a large number of modern time- and labor-saving electrical devices. A tendency toward a modern clean or so-called stream-lined design was apparent in nearly all appliance classes.

A feature of the exposition was the hall of science, which contained a number of the more spectacular developments in the electrical field, such as the "sun motor," "radio knife," "electric frisker" and "talking" light beam.

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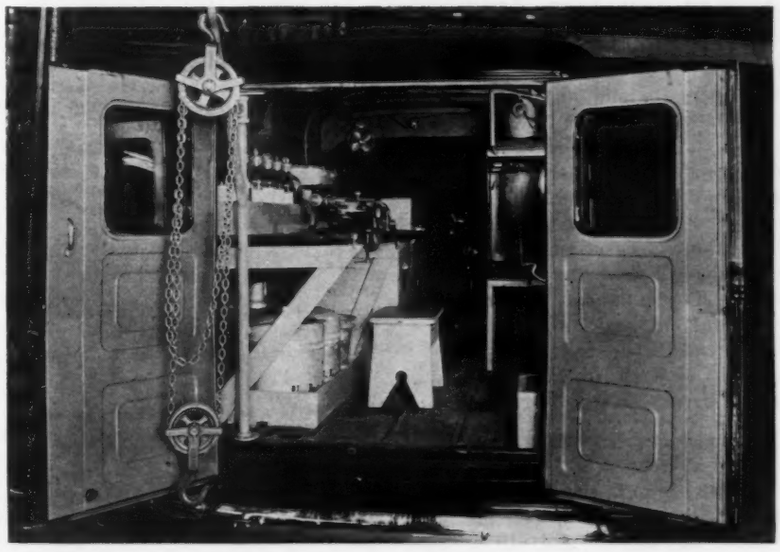
More Oil Burners

Shipments of mechanically driven domestic oil burners in July exceeded those of a year ago by 42 per cent, but were 4 per cent under 1933, according to statistics compiled by the Bureau of the Census. The figures are as follows: July, 1935, 7,454; June, 1935, 7,783; July, 1934, 5,237; July, 1933, 7,790. They are based on returns from companies that in 1933 produced about 88 per cent of the entire output of the oil-burner industry.

UNDERWRITERS' LABORATORIES GOES VISITING



To acquaint electrical jobbers and dealers as well as electrical inspection authorities with the inspection and test work regularly undertaken, Underwriters' Laboratories fitted out and placed in service last month traveling laboratories. The scope of the field laboratory work includes physical tests of rubber insulation, flame tests of flame-retarding finishes, copper sulphate tests of zinc coatings, tension tests and flexibility tests.

F.H.A. to Participate in Fire Prevention Week

In a communication sent last week to the National Fire Waste Council, Federal Housing Administrator Stewart McDonald announced that F.H.A. will co-operate with fire prevention agencies and industry and business as a whole in the observance of National Fire Prevention Week, October 6-12. "In view of the active interest of this Administration," Mr. McDonald said, "in fire prevention through the modernization of existing buildings and construction of new houses in accordance with high standards, I should like to say that the Federal Housing Administration will be glad to co-operate in every way possible with the National Fire Prevention Week program."

In eligible equipment that can be purchased from the proceeds of loans made by banks and private financial institutions having insurance contracts with the Federal Housing Administration are listed many items for reducing fire hazard that are sold by electrical dealers, F.H.A. announced. "Better homes are just as much a purpose of the Federal Housing Administration as more homes . . . Any electrical equipment that reduces the fire risk and becomes an integral part of the house will receive the approbation of the Federal Housing Administration officials who pass on home mortgages . . ." A special leaflet has been prepared by the F.H.A. on the relation of its program to fire hazard reduction.

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Lighting Fixture Orders Revive in New York Area

For the first time in more than four years demand for lighting fixtures shows a sharp increase, lamp manufacturers report. Contractors in the New York area working on hotels, apartment houses, retail stores and public buildings are making inquiry for volume quantities of fixtures for early delivery. A large part of the orders originate from contractors doing remodeling work. As recently as six months ago the market for fixtures was practically dormant.

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Tech Laboratories Formed

Tech Laboratories, with a factory located in Jersey City, N. J., has been organized to engage in the manufacture of a line of standard and special precision resistance instruments and allied products for industrial and laboratory use. M. Bjorndal, founder of the company, will serve in the capacity of president. He has been actively identified with the precision instrument field for the last decade, having served as chief engineer for both Hardwick, Hindle, Inc., and the Daven Company of Newark.

•

Government Spends Huge Sum for Electrical Equipment

A summary made by the National Electrical Manufacturers Association indicates the vast sums the government has spent in recent months for electrical equipment. The following table gives the value of material orders, covering electrical machinery, apparatus and supplies:

Sponsor of Projects	Value of Orders Placed	
	From beginning of project to April 15, 1935	During month ended May, 1935
Public Works Administration	$39,710,347	$1,145,698
Reconstruction Finance Corp.	971,829	36,323
Regular government appropriation	$1,179,113	$121,422

Chapman-Pelton Sign Trade Agreement

Arrangements have been concluded between the Chapman Valve Manufacturing Company, Springfield, Mass., and the Pelton Water Wheel Company, San Francisco, Cal., by which patents, manufacturing facilities and sales activities relative to valves for water works and hydro-electric purposes will be co-operatively utilized. The engineering and research data of both companies will be shared, and regional offices utilized to further joint interests in the above field. No changes in personnel or relocation of offices have been announced. It is anticipated that the co-operative agreement will facilitate coverage of territories at present handled separately by the two organizations.

Field Reports on Business

Special reports to ELECTRICAL WORLD indicate that the general business and industrial improvement that has been in progress for some time throughout the nation is being maintained.

NEW ENGLAND

From a widely diversified demand, electrical supplies and equipment are moving in increased volume in the northeast. A "pioneer" purchase of generating apparatus, the first for central station service for many months, has been made through the Stone & Webster organization for the Savannah Electric Company. Fixtures are moving rapidly; electric refrigerators continue to be sold in large numbers; house wiring for the Quoddy development workers at Eastport, Me., has made a start, and industrial heating units are figuring more actively in modernization budgets. Smaller household appliances are displaying considerable life.

The General Electric Company has sold a 7,500-kw., 400-lb., 3,600-r.p.m. steam turbo-generator wound for 13.8 kv. to the Savannah Electric Company, the condenser contract being secured by the Westinghouse company. About eight important industrial power plant projects involving about 25,000 kva. in generator rating are under negotiation in various Boston engineering offices. Street lighting business is very active, Belmont having purchased 42 combination mercury vapor-tungsten 10,000-lumen units for divided time use on Concord Avenue in that town. Thirty-five sodium lamps go to Braintree, Mass., for street service, also 10,000 lumens each. A $35,000 switchboard order has been placed by a Massachusetts industrial concern to replace apparatus lost in a fire. In the wiring supply field housing construction at Eastport is attracting interest, a recent contract for part of the work covering about $10,000 for wiring 240 apartments exclusive of fixtures. Later work is to be done in extensive barracks and other quarters. In Providence, R. I., a leading fixture house reports a rush of trade and some difficulty in keeping up with demand. Metal tube radio sets are moving faster and a vigorous fall campaign is starting. Less-than-carload orders feature the movement of pole line and interior wiring material at the moment. Several electric furnace units rated at about 50 kw. have been sold in southern New England for use in the metal-working field. Air-conditioning units are showing some improvement over last year, and electric motor sales are greatly scattered, piecemeal modernization continuing over a wide area. Collections are improving in wholesale circles and a trend toward the employment of additional city and counter salesmen is apparent.

CHICAGO AREA

Accelerating pace of business is observable as indicated by the fact that current month indices show larger gains over same period last year than do preceding months or does 1935 so far. Net sales for July, 1935, compiled by the Electric Association show about 20 per cent gain over July, 1934, while the first seven months of this year are 4.6 per cent over the similar period of 1934. The greater part of the increased buying is in the industrial and appliance fields, with utilities still quite reluctant, although considerably above last year. Utility purchases for capital account are rising, but are mostly confined to distribution equipment, meters, transformers, etc., used for replacement. Sales of major equipments for plant expansion, except to governmental units, are practically zero. But it can be said that utility pursestrings are not so tight as last year, although there is nothing yet that can be called lavish spending.

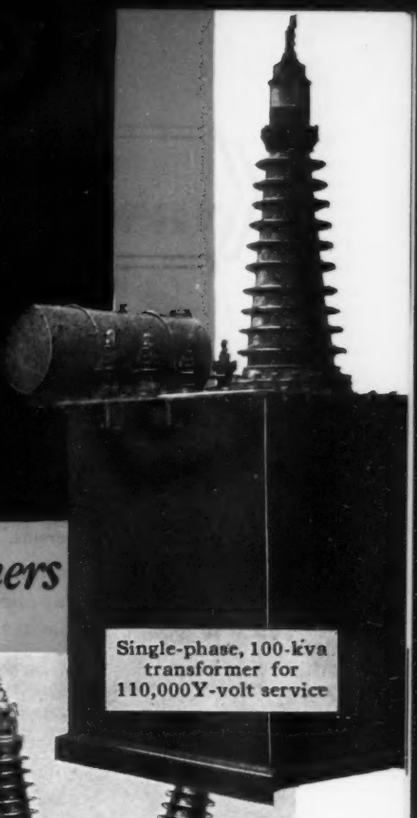
In the industrial field the picture is much more cheerful. Recovery in automobile manufacturing, directly and indirectly, has inspired much industrial construction and rehabilitation. Sales of control and heavy drive equipments to Great Lakes Steel at Detroit and to other steel plants in the Chicago region have made suppliers happy. Motors and control for resale as built in or attached to machine tools figure very largely in manufacturers' sales reports. Domestic appliances of all kinds are moving in greater flow than ever as the result of intensified selling pressure exerted by the utilities. Over all, the business feeling in and around Chicago is distinctly cheerful, but with an undertone of hope rather than of confidence.

You can serve small loads

ECONOMICALLY

direct from your high-voltage lines

With G-E small-capacity, high-voltage transformers



Single-phase, 100-kva transformer for 110,000Y-volt service

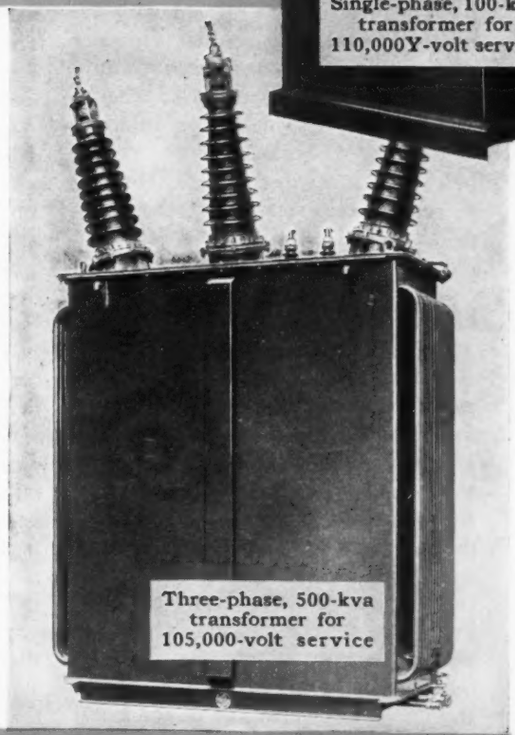
THEIR cost, including installation, is often considerably less than the running of intermediate-voltage lines from the nearest substation.

Electrical and mechanical soundness is built into every detail of their designs.

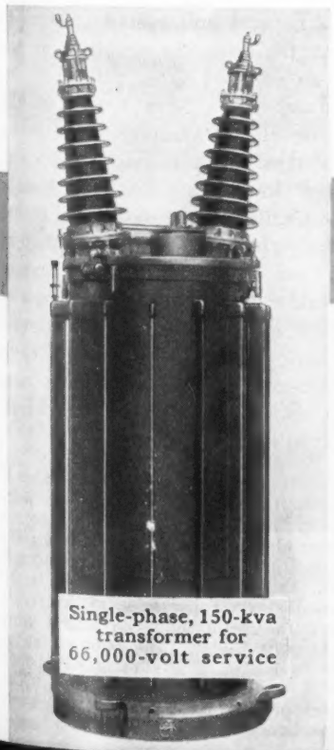
They provide the dependability that is so vital to every part of a high-voltage line that may be supplying large blocks of power to distant load centers.

Hundreds of them are now operating successfully on high-voltage lines in all parts of the country.

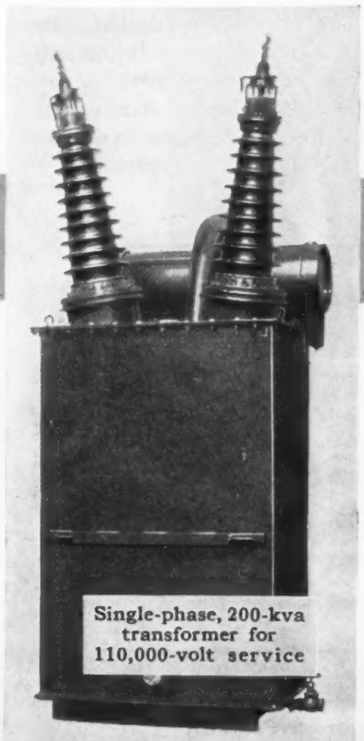
General Electric Company, Schenectady, N. Y.



Three-phase, 500-kva transformer for 105,000-volt service



Single-phase, 150-kva transformer for 66,000-volt service



Single-phase, 200-kva transformer for 110,000-volt service

WHY YOU CAN DEPEND ON G-E TRANSFORMERS

Each turn, layer, and coil is held solidly in position—even against the mechanical shocks of the most severe short circuits—by a bracing structure of exceptional strength.

All insulation is carefully designed and correctly applied to fulfill the exacting requirements of modern service.

300-23

GENERAL ELECTRIC

Pole-Type Capacitors Improve 4-Kv. System

By R. L. BOULDEN
Superintendent
Light and Water Department,
City of Riverside, Calif.

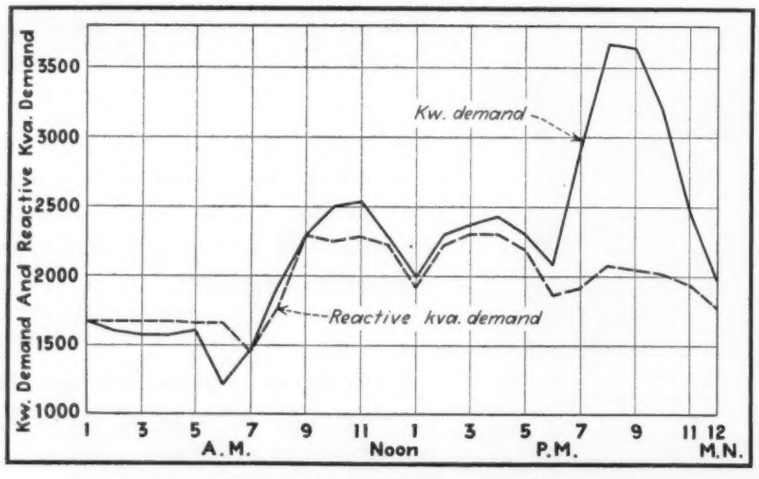
In a recent installation the city of Riverside, Calif., applied more than 2,300 kva. of capacitors directly to its 4-kv. distribution system with exceedingly gratfiying results. This was done because a survey showed it would lower the cost of purchased energy and improve the voltage regulation. A discount is earned if the over-all power factor is maintained above 70 per cent; below that figure there is a penalty. Compared with operating an old synchronous condenser, the purchase of capacitors was found to be most advantageous.

Using a type RA demand meter, connected as a reactive-kva. meter, and the wholesale power meter, the data graphed in Fig. 1 were obtained. The average power factor was 74 per cent, the kw. peak 3,700 and the reactive-kva. peak 2,300. Calculations disclosed that 2,000 kva. in capacitors would be an economical amount to connect permanently. However, 2,300 kva. was purchased and a portion used at the substation.

As locating the capacitors at the station would correct the power factor at the meter, but not out on the system, pole-mounted units were installed near inductive loads, which were responsible for the low over-all power factor. A demand meter, connected to each of the twelve 4-kv. distribution circuits for a twelve-hour period, determined the capacity necessary for each circuit. The average reactive-kva demand was taken as the capacity required for that particular circuit. The capacity was split up in pole-type sizes (50, 75 and 100 kva.) at each load center.

Check-up of each circuit with the demand meter indicated only one case where it was necessary to change the amount of installed capacity. A 350-kva. capacitor bank was connected to a spare circuit breaker at the substation to balance power factor during load changes. Later this bank will be installed on the lines for permanent correction.

Results from this installation prove very beneficial. Voltage was raised on the secondaries an average of 2 per cent. Distribution losses, which have been 9 per cent on the system for the past three years, should be materially reduced due to better regulation. Rebates for corrected power factor will pay off the entire investment in less than three years and thereafter the system will enjoy a nice return upon the capital invested in capacitors.



System conditions that determined corrective capacity

Material Needs of Rural Extensions

In connection with a recent investigation of the cost of building 1,168 miles of rural line extensions for furnishing service to 5,474 potential customers in Massachusetts the F.E.R.A. staff at Boston estimated that this work would require about 28,100 poles, 33,800 crossarms, 2,600 miles of wire, 2,300 distribution transformers, 5,400 meters and 4,600 ground rods. The expenditure of labor, running on the average at 28 per cent of the total cost, was estimated to require 330,265 man-hours of skilled labor and 521,393 man-hours of unskilled labor. Foremen, linemen and electricians were included in the former class, the unskilled class including linemen's and electricians' helpers, pole-hole diggers and tree trimmers. The estimates do not include the saving in capital cost in case future customers perform a part of the unskilled labor. The extensions involve average runs of 2.4 miles from existing systems located in virtually every county of the state. Typical unit costs employed in making the estimates are given in the table on page 54.

The estimates were made on the basis of close examination of every proposed extension route, coupled with detailed knowledge of recent field costs in utility practice. Truckage of material charges were computed at $0.75 per mile; storehouse charges were taken at 3 per cent of the cost of material, and 10 per cent was allowed for contingencies. The cost of engineering and field supervision was taken as overhead at 5 per cent of all other costs.

Depths of pole settings figured were 5 ft. for 25-ft. poles, 5.5 ft. for 30-ft. poles and 6 ft. for 35-ft. poles. With a ground clearance of 20 ft. under heavy loading district conditions of ½ in. ice, 8 lb. wind at 0 deg. F., and the maximum tension in the line conductor 60 per cent of its tensile strength, the permitted span length using 30-ft. poles is 225 ft. The same conditions applied to a 35-ft. pole allow a 320-ft. span and with 40-ft. poles a 390-ft. span. The estimates provide for using pin-type porcelain insulators, side or top-groove double-

What PYRANOL Means To Users of CAPACITORS

Approved by Underwriters

PYRANOL is General Electric's trade name for the nonexplosive, nonflammable liquid dielectric now used in all G-E capacitors. It has received the unqualified approval of the National Board of Fire Underwriters as a result of recent laboratory tests.

99.87% Perfect in Service

PYRANOL capacitors have made a remarkable record. Reported electrical failures amount to less than 0.13 per cent—a service record more than 99.87 per cent perfect.

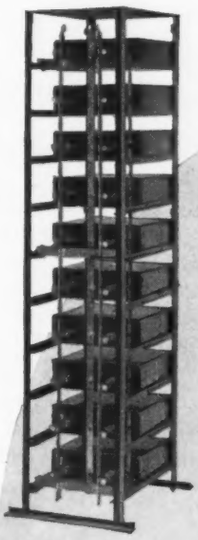
Savings in Space

PYRANOL, because of its superior dielectric characteristics, has made possible great savings in space. Ever since its use was introduced, in 1931, the size of G-E capacitors has steadily decreased, until now some ratings are as much as 75-per-cent smaller than the corresponding capacitors of five years ago.

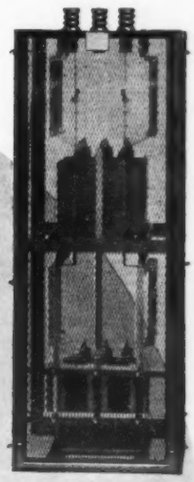
Accepted by Industry

PYRANOL capacitors are now being purchased at the rate of thousands of kv-a. each year by industrial users of power because they save money through power-factor improvement. Power companies, also, are using them more and more as a simple and economical means of increasing the capacity of generators and feeders.

Ask your G-E representative for a copy of our new Bulletin GEA-77H, "Improving Power-factor for Profit," or write General Electric, Dept. 6B-201, Schenectady, N. Y.

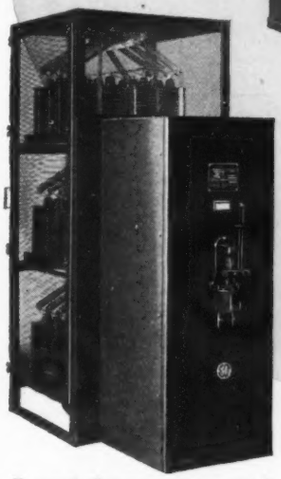


Enclosed, box-type capacitor unit for individual motor applications

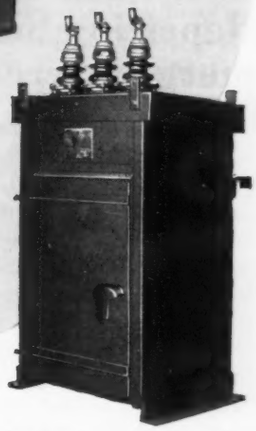


Small indoor equipment for primary circuits in substations and industrial plants

Small indoor low-voltage equipment, with screen removed to show unit arrangement



Large indoor capacitor, with oil circuit breaker completely enclosed in steel cubicle



Outdoor capacitor suitable for either crossarm suspension or base mounting

A complete line of G-E Pyranol capacitors for power-factor improvement

360-109

GENERAL ELECTRIC

Major Unit Costs in Rural Line Estimate

30-ft. pole, Southern pine, treated full length, in place:	
Soft soil	$16
Medium soil	17
Hard soil	19
Crossarm, fir, treated, in place:	
Four-pin single	1.90
Four-pin double	4.12
Anchor guy, patent anchor, in place	11.50
Head guy, in place	7.50
No. 6 AWG wire, equivalent 2-strands copper, 1-strand copper-steel reinforced, in place, per 1,000 ft.	25.20
Transformer, 1.5-kva., 2,300/4,600—115/230 volts, with protective equipment, in place	90.67
Transformer, 3-kva. ditto	107.23
Meter, three-wire, 115/230 volts, in place:	
5 ampere	13.25
25 ampere	20.00

petticoat, rating approximately 7,500 volts. Secondary conductors, where indicated, duplicate those used for primaries. Guy wires were ⅜-in. galvanized, seven-strand, Siemens-Martin steel, and anchors galvanized cone with ¾-in. x 6-in. galvanized rod. Transformer ratings varied from 1.5 to 15 kva. and services were either two- or three-wire No. 6 AWG solid, triple weatherproof braid. Secondary and pole service racks were of the three-spool, hot-galvanized, heavy-service type.

The total estimated cost of the extensions was $2,024,549, not allowing for reductions due to rural labor or joint usage arrangements.

•

Repairing Submerged Screen Well

While cleaning the rotating screens in the circulating water supply at the generating plant of the Lynn (Mass.) Gas & Electric Company it was found impossible to unwater one section, due to a leak where the wall adjoins the floor mat. A diver reported a crack at this point about 12 ft. long. Further investigation indicated that the floor mat had not settled, but that the difficulty was caused by unsatisfactory bonding of the concrete at the joint. Each screen has its own well and motor-operated gates make it possible to isolate either section.

The repair problem appeared difficult and costly as the work had to be done 20 ft. under water. Recourse was had to the use of an under-water cement developed by the Crandall Engineering Company, Cambridge, Mass., which supplied trained masons for diving purposes. It was found that portable electric lights were of no value on account of the depth of the job, so the crack was cleaned and repaired in the dark. After the necessary cement repairs were made on the inside and the original form work was removed from the outside external repairs were made. The screen well was then unwatered without difficulty and inspection showed that a creditable job had been done under these difficult circumstances.

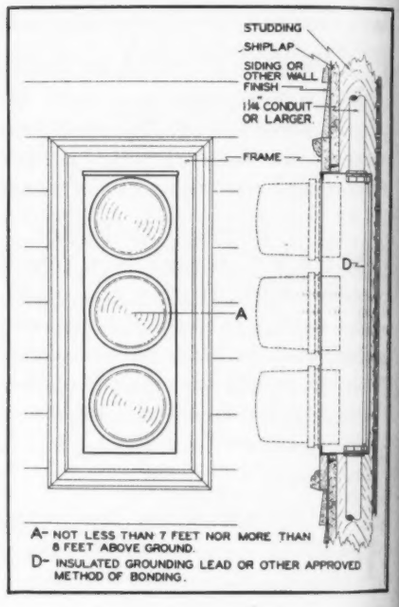
•

Flush Cabinet For Outdoor Meters

By E. F. ANDERSON
Portland General Electric Company, Portland, Ore.

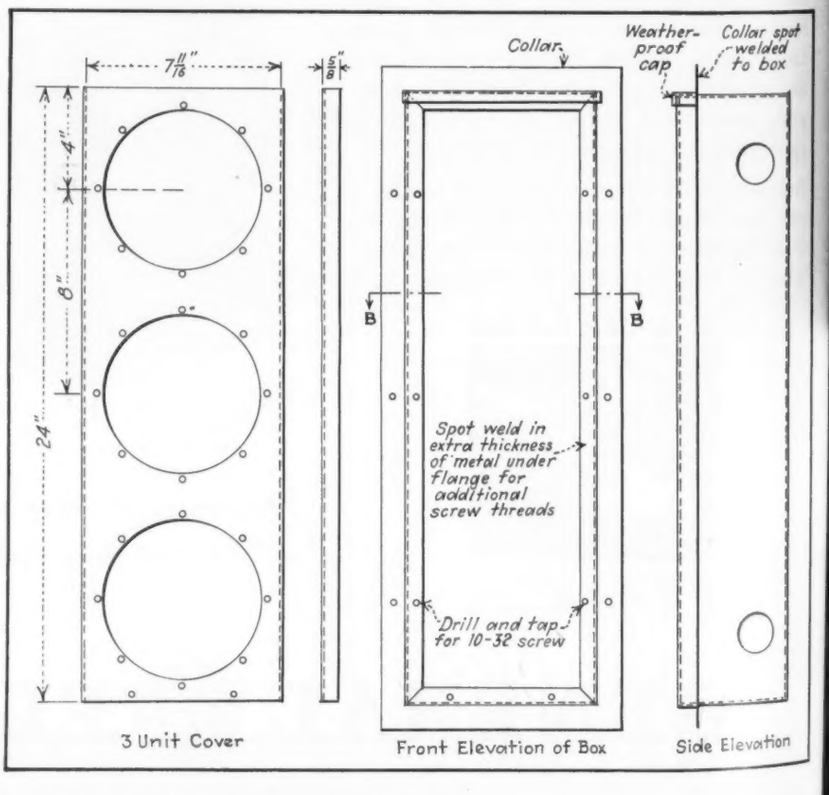
When services are converted to new-sequence metering certain customers object to exposed conduit or service-entrance cable on the sides of their homes. To overcome this objection a standard flush-type installation has been evolved which incorporates some interesting features. The cabinet is adaptable to either underground or overhead service entrances. It is weatherproof, tamperproof, fireproof and interior is accessible and of ample capacity for all types of services. It is neat in appearance and of low cost.

Only one size of cabinet, with three types of covers, is used. If only one meter is required it is mounted in the center of the cover to take advantage of the sealing feature illustrated. If two meters are required, as with off-peak water heating, the two lower positions are used. If a time switch, also, is needed it is placed in the upper position.

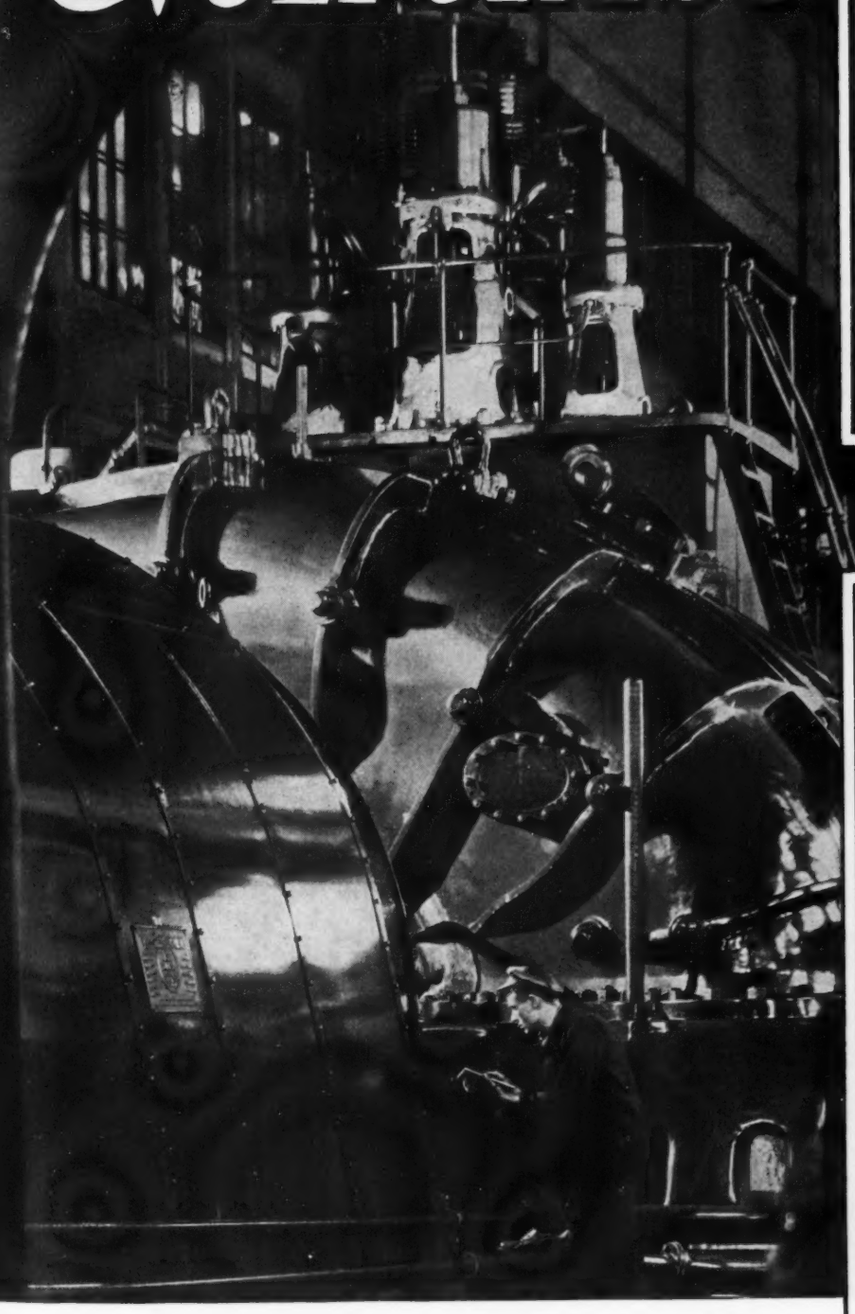

STUDDING
SHIPLAP
SIDING OR OTHER WALL FINISH
1¼" CONDUIT OR LARGER
FRAME
D
A
A- NOT LESS THAN 7 FEET NOR MORE THAN 8 FEET ABOVE GROUND.
D- INSULATED GROUNDING LEAD OR OTHER APPROVED METHOD OF BONDING.

Figs. 1 and 2—Flush-type installation for new-sequence metering

Will accommodate three ring sockets of channel-mount type. Eight screws in socket clamp the socket, cabinet cover and gasket together, forming a watertight seal. Two of the screws go through flange in box, making unnecessary sealing screws or wires as screws cannot be backed out. Cabinet cover slides under overhanging cap, which with "L"-shaped collar around box forms weatherproof seal. Only gasket needed is between meter socket and cover.



GULFCREST



..."The FINEST TURBINE OIL WE KNOW HOW TO MAKE"

..Say Gulf Scientists

4 REASONS

WHY GULFCREST OIL IS THE TURBINE LUBRICANT *of* UNPARALLELED QUALITY

1 *Refined by the ALCHLOR Process.* This famous process, patented and owned exclusively by Gulf, is the most thorough and effective method for removing chemically active hydrocarbons as well as the general run of impurities present in all crudes.

2 *Highest resistance to oxidation.* Because this famous ALCHLOR Process synthesizes and rearranges the molecular structure of certain hydrocarbons, resulting in a finished product of greater stability, GULFCREST OIL stands alone in its high resistance to oxidation.

3 *Highest resistance to acidity and sludge.* Because of the elimination of oxidation catalysts in addition to the unparalleled refining power of the Alchlor Process, these oils form less gum and deposits, less emulsion and sludge, when mixed with water over a period of several years continuous operation, than any other turbine oil of which we have record.

4 *Highest kilowatt-hour performance.* Because Alchlor not only makes possible an oil more thoroughly refined and homogeneous but also creates antioxidants, these oils have great resistance to deteriorating influences and are longer lived. Less makeup oil is required.

Only Gulf Can Offer You A Turbine Lubricant With These Unparalleled Features

"HE only turbine lubricant treated by the ALCHLOR process is Gulf-t Oil!

That is a significant fact. For the use this famous process — exclusively lf's — permits the manufacture of a re stable turbine oil than is possible ny other process yet developed.

That is why GULFCREST OIL has the highest resistance to oxidation and to the formation of acidity and sludge. The performance records of this oil in turbine systems of leading power plants are unparalleled. It is the safest and most economical turbine lubricant you can buy.

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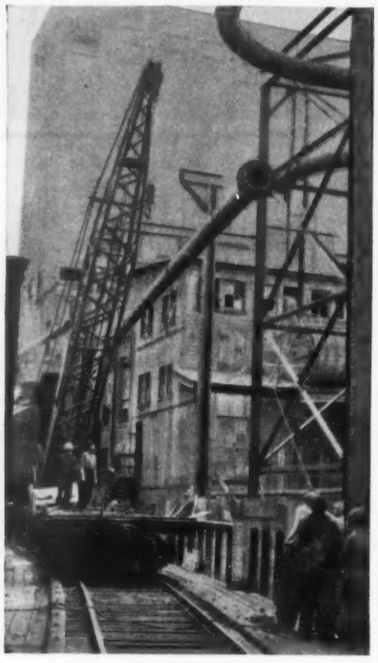
POWER AT WORK IN INDUSTRY

LIGHTING • MOTORS • CONTROL • HEAT • AIR CONDITIONING

Welds High-Pressure Steam Line

Steam at 600-lb. pressure and 720 deg. F. to be carried 930 ft. from boiler to turbine was a requirement that arose in certain improvement construction at the Piedmont, W. Va., plant of the West Virginia Pulp & Paper Company. It was decided that arc welding would save money in the piping. It did, and very largely because the piping was erected as a "rainy-day" job; that is, the two men employed in the welding could not work on it all the time, since other construction and repair jobs had to be done. Work was started in September and finished in November.



Lincoln Electric Company

Arc welding high-pressure steam line

Raising 100-ft. section of pipe into position with a locomotive crane. The flanged connection is for an expansion bend.

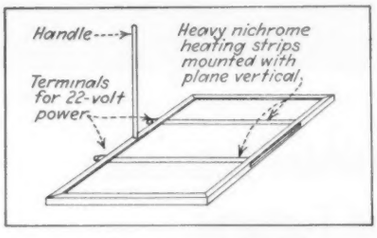
The line was built of 14-in. (outside diameter) seamless hot-drawn tubing $\frac{21}{32}$ in. thick. The flanges are regular 600-lb. standard forged steel ($23\frac{3}{4}$ in. outside diameter). A total of 58 welded joints were made. Of these, twenty are flanged joints, two sleeves on two expansion bends, two position welds on pipes, two beads inside of fittings. The remaining 30 welds are rolls. The two welding operators regularly employed by this plant did all the welding on this line. Tests were made by filling the line full of cold water and pumping it up to 1,500 lb. per square inch hydrostatic pressure. Each joint was inspected under this pressure and found absolutely tight.

•

Cuts Plastics With Electric Heat

Industrialists handling compounds which solidify at normal temperatures may find the device developed at the Oakland., Calif., plant of the Gardner Transformer Company of value. There insulating materials are received in barrels in solidified form, too large to be handled readily after the staves are removed. Attempts to chop the material into smaller pieces required too much time and labor because of the tar-like consistency of the compounds.

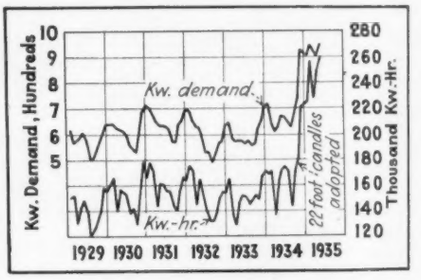
Consequently, a heavy angle-iron frame was constructed, across which two heavy nichrome heating strips were attached vertically and with such separation as to divide the area into three parts. With this device energized and set on top of the barrel-shaped chunk of material the heating elements, plus the weight of the frame, cut through the material quickly, dividing it into portions which are easily handled.



Heated device cuts solidified plastics into easily handled pieces

22 Ft.-Candles for Department Store

Recent comprehensive improvements under way at the noted department store of G. Fox & Company, Inc., Hartford, Conn., include a striking initial installation of new lighting facilities designed to provide localized general illumination of about 22 ft.-candles on the counters of the street floor shop and other high-grade lighting under the balconies and on the mezzanine selling spaces. The store management desired to obtain the full effects of modern lighting without distracting the attention of customers from the merchandise on display. This was accomplished by a special built-in design provided by the Holophane Company which combines the use of control lenses with sand-blasted prism glass and steel louvers, in the lighting of the main floor, while the balcony sections were generally equipped with flush-type units. The illuminating engineering department of the Hartford Electric Light Company, which supplies energy to the store, co-operated with the management in an extended study of trial installations of fixtures which resulted in the final selection.



Utility load jumps from 160,000 to 250,000 kw.-hr. per month when store boosts lighting

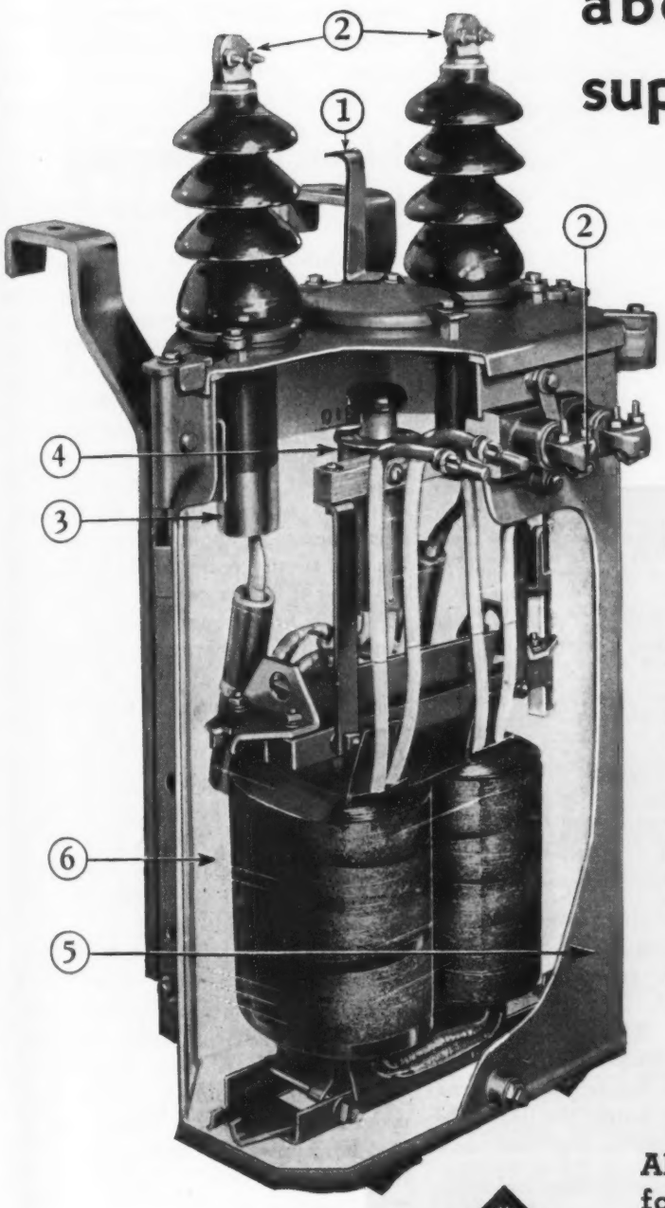
The new luminaires (about 44 in. long x 20 in. wide x 6 in. deep) provide a 45-deg. downward spread and, with the spacing employed, furnish a remarkably uniform illumination all through the selling levels. To break the effect of a flat illuminated surface

Look Inside

Most Distribution Transformers look about the same, on superficial examination

But!

Before Buying . . . Check these points



(1) Are the bushings coordinated? *

(2) Are solderless connectors provided?

(3) Are bushing shanks under oil?

(4) Is a tap changer provided?

(5) Is the protective finish BAKED on the tank?

(6) Is the transformer oil-tight, permitting shipment completely filled with oil?

* A gap is provided for each bushing.

Allis-Chalmers surge protected transformers have all of these features and many more. For the "Inside Information" on distribution transformers, write for Bulletin 1173.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A.

Remarkable visual acuity and absence of glare and shadows from high-mounted general-localized units

On main floor (ceiling height 15 ft. 10 in. to 16 ft. 8 in.) are four luminaires per 19½x21-ft. bay, units 10½ ft. apart on each side of aisle center line and 9 ft. 9 in. apart on centers longitudinally. This arrangement provides two luminaires over each counter edge between columns. In each luminaire there are three outlets with 100-watt lamps, but larger sizes up to 200 watts may be used in place of the initial units if desired. Very close to 50 ft.-candles intensity can thus be had by simply changing the lamps and making certain that all units are clean and new. The initial installation requires 2.93 watts per square foot of bay on the main floor.

Flush-type units under balcony provide 16 ft.-candles

Flush units with three triple lenses and three 100-watt lamps, spaced 9 ft. x 11 ft. apart, with ceiling height 7 ft. 8 in. Three 200-watt lamps can be used per unit if desired. Below the mezzanine ceiling on the street floor are 129 single lens units equipped with a 150-watt lamp in each case (ultimate capacity, 300 watts), with 6 x 8-ft. spacing and about 15.3 ft.-candles at the counters.

on the sides, the luminaires are each provided with a steel louver which is carried all around the fixture, the sides of the fixture being of light opal glass. The lamps are mounted in spherical reflectors in the top of the luminaire with each lamp directly above its corresponding "controlens," the borders of the fixtures at the bottom being of sand-blasted prism glass. The wiring provides for leaving one lamp in each luminaire in service during store cleaning, so that by proper switching four 100-watt lamps will be on per bay for this purpose.

Absence of disturbing shadows, glare and lack of conspicuous fixtures in any portion of the main floor or mezzanine balcony are outstanding features of this installation. The improved illumination of 22 ft.-candles is obtained with an energy expenditure of about 1,170 watts per bay, compared with 3.3 ft.-candles at 1,450 watts in 1916 and 6.6 ft.-candles at 500 watts just before this modernization. In other words, the illumination per 1,000 watts expended has been stepped up from 2.3 ft.-candles to 18.8 ft.-candles.

•

Close Limits on Carbon Content

In a run of more than 200 heats of iron castings on one analysis total carbon varied only six points, from 2.18 to 2.24 per cent. This result was obtained at the Carondelet Foundry Company of St. Louis with a 3,000-lb. Detroit Electric "Rocking" furnace. A typical day's production includes some six base mixtures with from three to five additional alloy mixtures—all from the same furnace. Upward of 75 types of iron have been standardized, ranging from 2.00 to 3.50 per cent carbon and from 0.75 to 3.00 per cent silicon. An entire year's production of ammonia-valve castings showed less than 5 per cent rejections in foundry and machine shop combined.

•

Electric Pumping Gains Headway

Conditions of electrical supply have improved so materially that motor-driven centrifugal pumps are much more widely used than formerly in municipal water service, according to W. H. Sears, mechanical engineer of the Boston metropolitan district commission, speaking before the New England Water Works Association. The efficiency of centrifugal pumps has been increased about 15 per cent in the past twenty years, he declared, and at values of 90 per cent or a little over, not much further progress can be expected. The synchronous motors, almost universally applied in driving such pumps in sizes of above 100 hp., run between 96 and 98 per cent in efficiency. An over-all test of efficiency from wire to water at the Brilliant pumping station of the city of Pittsburgh, Pa., gave 87.5 per cent for an installation where the capacity of the individual unit was 28,000,000 gal. per day at a head of 365 ft.

Mr. Sears pointed out that the gasoline engine is valuable chiefly as a standby in municipal pumping stations. Diesel-driven units are being adopted for installations of less than 400 hp., but he pointed out that while progress in lightening Diesel weights per horsepower is continuing, with resulting reduction in first cost, these prime movers are still in the development stage. Satisfactory rates for power and multiple sources of supply, Mr. Sears said, are vital factors in determining whether electric, steam turbine or other forms of drive shall be used. Triple expansion engine drives appear to be out of the competitive picture, their first cost, including boiler plant, being fifteen times that of comparable motor outfits.

Multiple Connector for Secondary Junctions

[*Continued from page 31*]

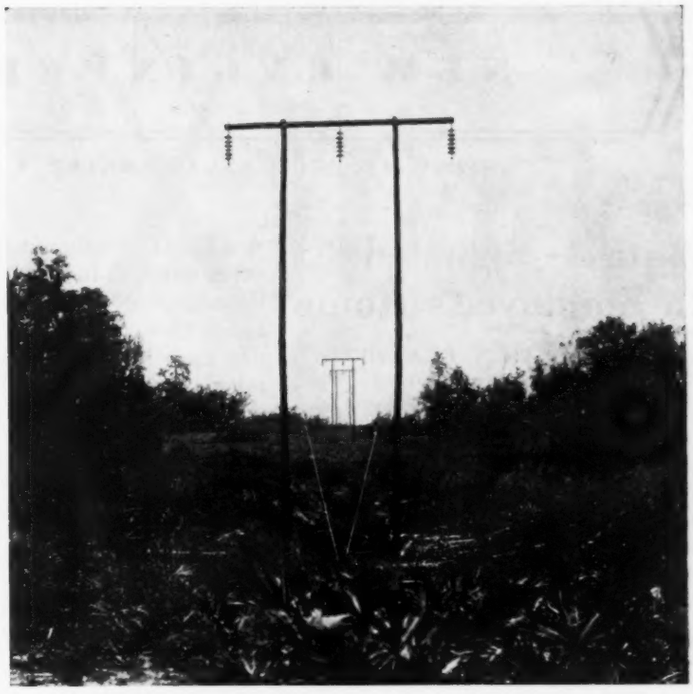
body may be connected by merely using a corresponding size of cone. The sizes now in use are from 250,000 circ.mil to No. 6. The possibility of failure of the connector as a result of short circuit has been guarded against by making its capacity so great that the conductors will burn out before the joint. On all connections, before tape is applied, the exposed metal parts of the connector, the exposed insulation of the conductor and that portion of the rubber insulation of the connector over which the tape is subsequently wound should be painted with an insulating cement.

Rubber tape protected by friction tape and insulating paint is used where conditions permit. However, where a stop joint is necessary to protect the rubber insulation of the connector or to protect other cables from oil or compound acetate tape is applied in tightly drawn wrappings, each wrapping painted with a sealing compound. The acetate tape is held in place by friction tape, which, in turn, is coated with insulating paint. Rubber tape may be used between the acetate tape and the friction tape to give the joint a better contour. Where lead-covered cables are used the sheaths are bonded.

The connector may be supported in manholes by a small single hanger attached to an existing stanchion in the manhole, or lagged to the wall. The hanger now in use is made of galvanized iron with two prongs that fit under the top cable connections.

The final total cost of the insulated multiple joint with eight cables connected will be approximately two-thirds the cost of the equivalent joints using ordinary splicing methods, since the cost of each new connection is less than one-half of a new splice. Where only a few connections are required the economy is not so evident. The saving is accounted for by the difference required to break down and rebuild a splice as compared with the time necessary to make the mechanical joint.

While there is little operating experience with the insulated multiple connector, the design has proved practical as to cost and ease of installation and is expected to prove entirely satisfactory.



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FAR sighted judgment, looking beyond immediate economies in first cost, dictates the choice of poles on the basis of long service and low annual cost.

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The standing of this company in the field of wood preservation assures quality in AmCreCo poles far above minimum specification requirements.

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LOUISVILLE — KENTUCKY

Outages Signaled in Employee's Home

By KENNETH N. REARDON
West Penn Power Company,
Pittsburgh, Pa.

Three types of relays have been devised by the electrical engineering department to function in an operation supervisory capacity. They notify company employees or agents by means of bell alarm when abnormal conditions exist within a substation or on an important power service feeder. All types remain in the operated position until reset manually and all are complete as a unit consisting of relay, signal bell and batteries. The bell can, however, be installed wherever desired.

Type A, for supervising power lines, can readily be plugged into the house circuit of the attendant who receives service from the distribution line under supervision. It has a time delay of about two seconds to avoid alarms on short system voltage surges.

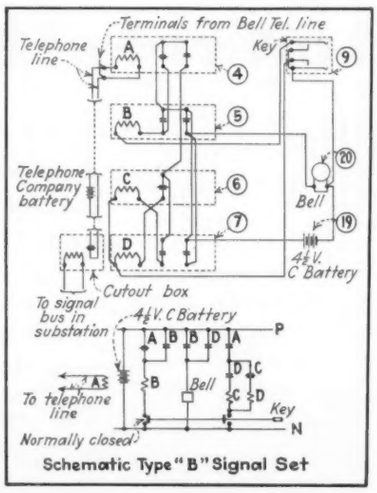
Operation supervisory relay works over leased telephone line

Bell rings steadily until alarm cutoff switch is thrown to "off." With switch in that position, when supervisory circuit is again complete and normal, the bell rings intermittently until alarm cutoff switch is thrown to "on." No connections are necessary other than those of the leased telephone circuit. Supervisory energy is derived from the telephone company battery by arrangement made when lines are leased.

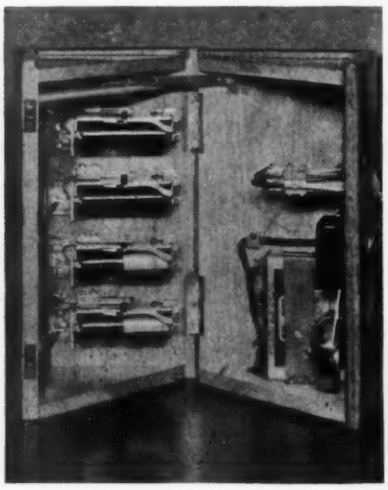
A white light indicates that the alarm cutoff switch is in the off position with the supervised power circuit normal. If two lines are supervised at one location a green light in the corresponding relay indicates that an operation has taken place and that that particular line is abnormal.

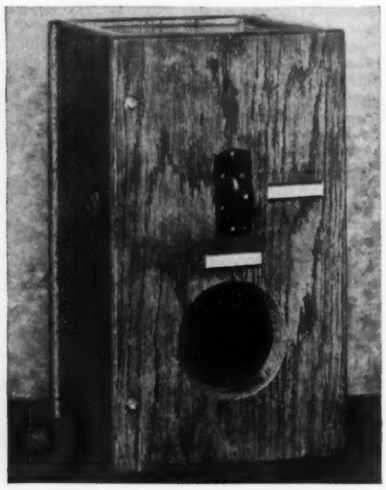
Type B, for supervising substations, works without time delay if the supervisory circuit is broken. This type has no signal lights. One particular installation gives notice (by means of leased telephone circuits in series) in homes of two company employees, as well as in the local office, of abnormal substation conditions. Disconnecting the battery is the only means of cutting the alarm out of service, but this has proved satisfactory because operations do not prove to be so frequent that battery replacement has been burdensome where discharged completely because occupants are absent for extended periods.

Type C has an all-night cutoff contact (added to the switch of B) which lights a pilot lamp to show that the alarm circuit has been switched out of service. This type is used in company offices unattended at night.



Schematic Type "B" Signal Set





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Set Makes Field Test of Bushings

By J. H. FRAKES
Circuit Breaker Engineering Department,
Westinghouse Electric & Manufacturing
Company, East Pittsburgh, Pa.

Growing largely out of a request by the Pacific Gas & Electric Company, a portable power-factor test set has been developed which affords readings obtained directly from bushings in working position in circuit breakers and transformers. It is essentially an inverted Schering bridge. Since the primary purpose is the testing of insulation in normal operating position, generally with one end at ground potential, the potential and ground corners of the conventional bridge are interchanged.

The circuit is shown in Fig. 1 and its operation indicated by Fig. 2. In the latter the voltage E_L and the loss angles are greatly exaggerated to show the effects. The current I_2 through the no-loss standard air condenser C_3 leads the voltage E_H by 90 deg. This current I_2 is divided in the other side of the bridge into two channels R_4 and C_4. The resistor R_4 is fixed and equal to $10{,}000/2\pi f$. The capacitance C_4 and resistance R_5 are varied until the galvanometer comes to a null reading, making I_1R_5 equal $I_{R_4}R_4$ both in magnitude and phase position. For precise results the shield potential $I_{SH}Z_{SH}$ is also made to balance $I_{R_4}R_4$, thus eliminating any loss from bridge circuit to shield. The tuned galvanometer in the circuit eliminates the effects of harmonics since it is responsive only to the fundamental frequency.

The bridge is capable of operation from any 115-volt supply at 60, 50 or 25 cycles. The transformer used in the P.G.& E.tests (reported also in this issue, page 29) gave a testing potential

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—and that's where the tamperproof Murray Padlock Seal gives real protection against loss

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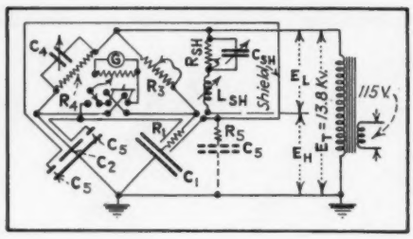


Fig. 1—Schering bridge inverted for bushing tests

C_1 and R_1 = Capacity and resistance equivalents of losses in test specimen.
C_2 = Standard air condenser capacitance in micro-microfarads.
R_3 = Decade resistance box, 0 to 1,111 ohms, by 10ths of ohms.

$$R_4 = \frac{10{,}000}{2\pi f} = 265.5 \text{ ohms for 60 cycles,}$$

318.3 ohms for 50 cycles and 636.6 ohms for 25 cycles.
C_4 = Decade condenser 0 to 11.11 microfarads by 0.001ths.
C_5 = Capacitance of guard rings and shield, to ground.
R_{SH}, C_{SH} and $L_{SH} = Z_{SH}$. Shield potential control variables.
G = Vibration galvanometer

When the bridge is in equilibrium, the formula for the unknown capacitance (test specimen) is:

$$C_1 = C_2 \times \frac{R_4}{R_3}$$

in which C_2 and R_4 are known constants. The power factor $COS\ \theta$, is substantially equal to $COT\ \theta$ up to values of 0.10 and within this range is computed as:

$$COS\ \theta = COT\ \theta = TAN\ (90° - \theta)\ \frac{C_4}{10} \text{ or}$$

per cent power factor $C_4 \times 10$

For values over 0.10 the true value of $COS\ \theta$ is read from a calibration curve or may be obtained from trignometric tables.

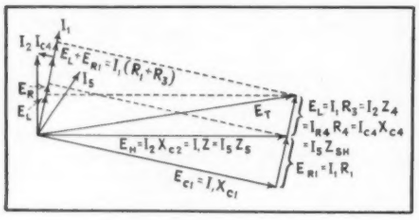


Fig. 2—Vector diagram of bushing-test bridge

E_H = Voltage across high-voltage arms.
E_T = Transformer secondary voltage 13,800 volts.
I_1 = Current through C_1, R_1 and R_2.
I_5 = Current through C_5 and Z_{SH}.
E_L = Voltage across low-voltage arms.
$E_T = E_H + E_L$.
I_2 = Current through C_2 and Z_4.
I_{C_4} and I_{R_4} Currents through C_4 and R_4 respectively.

$$I_{C_4} + I_{R_4} = I_2$$

Note—Condenser power factors and voltages across bridge instruments are greatly exaggerated.

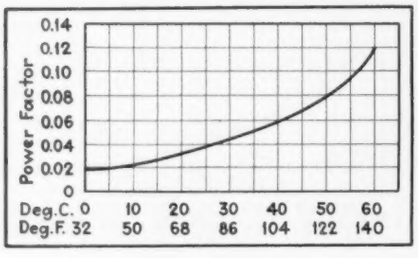


Fig. 3—Temperature correction for portable power factor bridge

In field tests condenser bushings showing power factors below the curve (at the existing temperature) were considered satisfactory. Those falling on or slightly above were considered doubtful.

of 13,800 volts. Power-factor readings could be made from 0.0001 to 0.73 with measured capacitances from 40 to 8,000 micro-microfarads.

•

Air Conditioning Saves Carbon Brushes

For many years it was known that carbon brushes on rotating electric machines wore out faster in winter than in summer. Then the new art of air conditioning began to be talked about, and in the sub-station department of the Commonwealth Edison Company some one suggested that maybe there was a connection between the rapid wear of the brushes and the winter condition of the air in the sub-stations. Investigation quickly showed that an increase in air humidity caused a decrease in brush wear.

Experimentation to determine the optimum humidity and to develop a satisfactory device for inserting water into the air resulted in what is shown in this picture. The disks of the two humidifiers on the screen are driven at high speeds by motors—the one at the right is shown in motion, while the other is at standstill. The motor is just visible behind the disks at the left. The goosenecks are of tubing, from which jets of water strike the centers of the disks. Mechanical atomization follows.

•

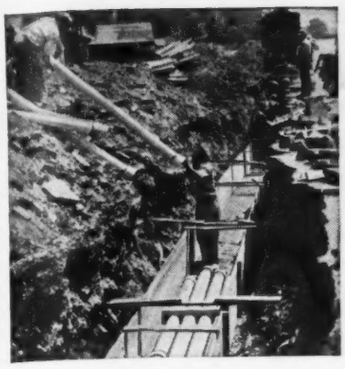
Steam at 1,911 Lb.

Several unusual features are embodied in a new steam-driven electric power plant being erected by the German chemical and dye trust, I. G. Farbenindustrie A.G. at Leverkusen. The cost is to be between $1,400,000 and $1,600,000.

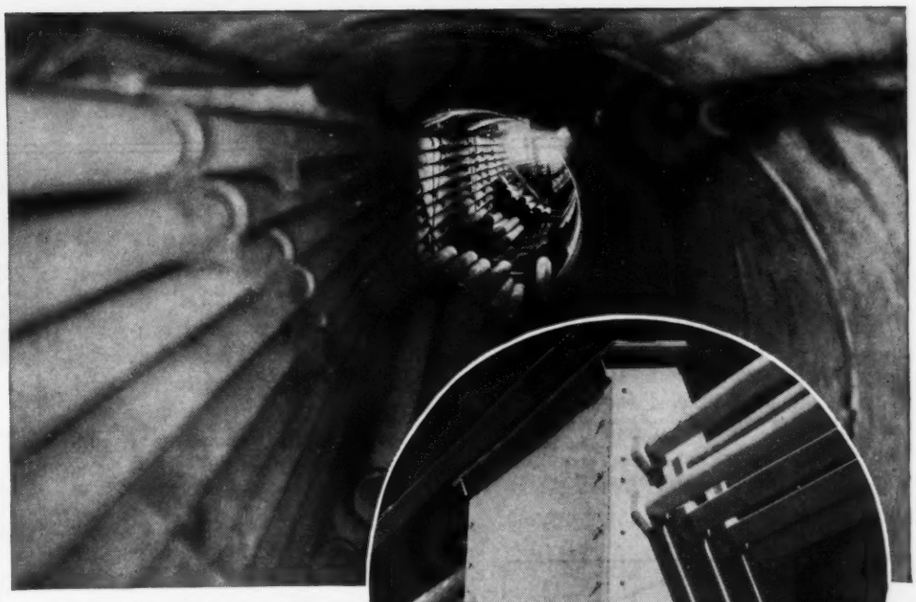
The most outstanding new departure is the absence of a smokestack in the usual sense of the word. The plant will be built in the form of a large office building, some six stories tall and with a tower about eight stories higher than the principal part of the structure. The boilers will be placed at the bottom of the tower. Inside the main building and on top of the boilers, which are to be 25 meters (82 ft.) high, electric equipment is to be placed for cleaning the smoke. Above this cleaning equipment there is to be a suction device to expel the cleaned gas. This is stated to be of such efficiency that 98 per cent of the dust can be removed from the smoke. The dust is then reintroduced into the fireboxes. The new type of smoke disposition is said to be very expensive and to be in a great measure an experiment.

Boiler pressure is to be 1,911 lb. per square inch, with pulverized coal fuel.

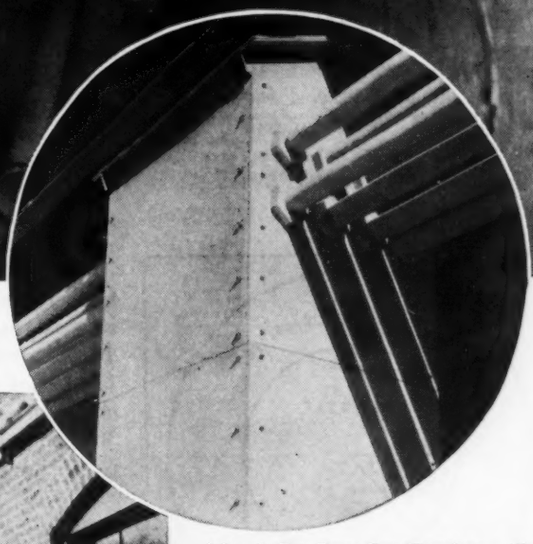
Hydrometer dial and humidity chart check performance of the humidifiers



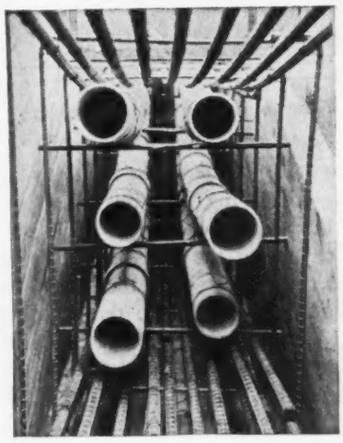
Underground System. 36,000 feet of 4" Transite Conduit in a 12-duct bank installation by Dayton Power & Light Co., Dayton, O.



Under a River. Pennsylvania R. R. Tunnel under the Passaic at Newark, N. J. Transite is incombustible; has high resistance to arc.



(above) *For Buss Bar Housings.* Shell Chemical Co., Shell Point, Cal. *Permanent*, Transite is immune to electrolysis, incombustible, weatherproof.



Under Channel Crossing. Pacific Gas & Electric Co., San Francisco. Solid block of concrete poured around Transite Conduit; the whole then laid in bottom of channel. Smooth bore, low coefficient of friction permitted long cable pulls without damage to sheathings.

(left) *Exposed Outdoors.* Turners' Falls Power & Electric Co., Mount Tom, Mass. Absolutely weatherproof, Transite assures permanent efficiency in outdoor installations.

ABOVE, and to the left, a series of photographs illustrating the *adaptability* of Transite Conduit.

Below, the characteristics that permit such great adaptability . . .

Strength . . . Transite Conduit is *strong*. It withstands soil stress, earth load, all ordinary street traffic.

Permanence . . . Transite Conduit is *permanent*. It is highly resistant to soil corrosion, immune to electrolysis, and absolutely weatherproof.

Incombustibility . . . Transite Conduit is *incombustible*. It is unharmed by smoke and corrosive fumes. And burn-outs generate no smoke, fumes or combustible gases.

Furthermore, Transite Conduit has a low coefficient of friction; cables pull without damage . . . it has a high rate of heat dissipation . . . and it is easily and economically installed.

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(Transite Conduit available only in the United States and Canada.)

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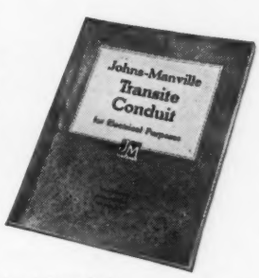
CONDUIT
JM PRODUCTS

On Bridge Over R. R. Tracks. Edison Electric Illuminating Co., Boston, Mass. Transite Conduit is *incombustible*. Unharmed by smoke and corrosive fumes.



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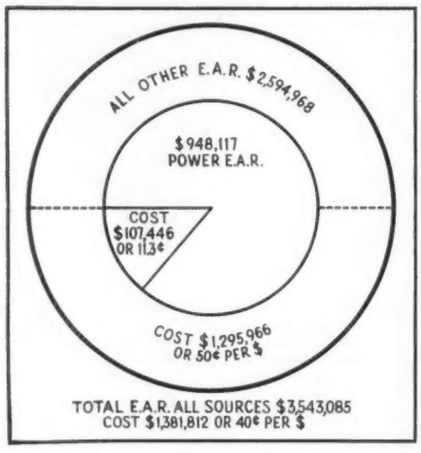
Pay Less for Power Revenue

A well-planned power sales activity reduces the average cost for all commercial and new-business activities and increases the net. For instance, power sales work in 1934 increased the reported estimated annual revenue



Effect of power sales on new business costs

from new business of companies in the Middle West group by 36.2 per cent, increased the commercial and new-business costs only 8.3 per cent and had the effect of reducing the cost for all other commercial and new-business activities from 50 cents per dollar of annual revenue to 40 cents per dollar for total estimated annual revenue secured from all sources, including power. The actual revenue, which showed up in 1923 as a result of the estimated annual revenue added, much more than paid the cost of securing this business and connecting it to the lines.

•

Saves Cost in Restaurant Business

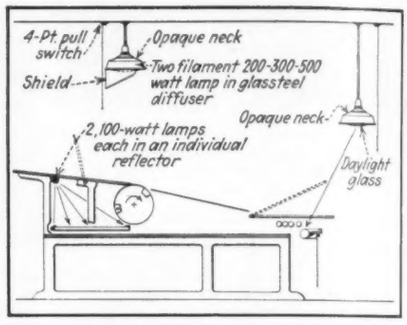
Restaurants find the greatest appeal of air conditioning to be reduced spoilage of food supplies. In one case the latter item had previously been $500 a month, or 25 per cent more than the power bill. Only about 40 per cent of a restaurant bill is due to food cost and the remainder to overhead, which does not increase proportionately with increase of food served. Consequently a large portion of any increased income produced by air conditioning is available to offset the fixed and operating charges thereof.

According to data on the Hotel Gibson, Cincinnati, the average increase in daily sales of meals (June to September) was 45 per cent, average increase in covers (July and August) 43 per cent, average increase in bills (July and August) 22.5 per cent, increase in net profits (July and August) 30 per cent, year-round increase in patronage 10 per cent.

•

Printing Press Light Requirements

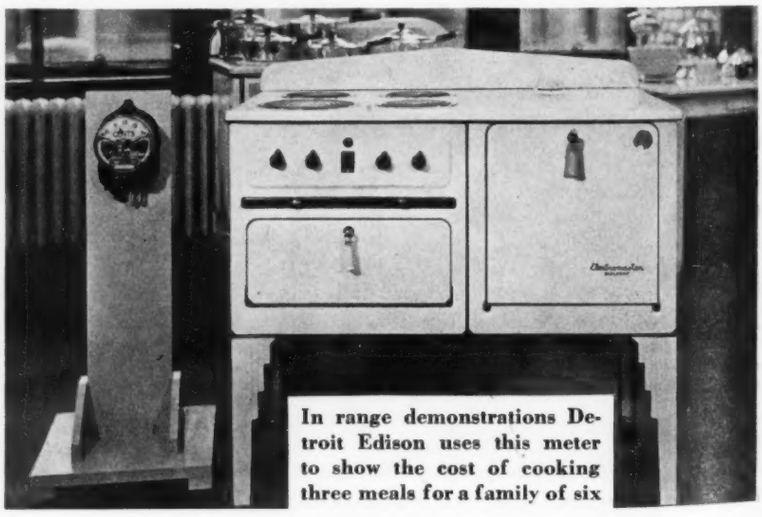
From investigations of lighting in a number of Chicago job shops the Chicago Lighting Institute has developed a recommended layout for the ordinary two-revolution, flat-bed, cylinder press. On the bed of the press, where underlaying, straightening up, correction of errors, flattening down, etc., are performed, investigation showed portable lamps frequently hung under the feed board for lighting the press bed, and bare lamps always used. The



How to light a printing press

average of all intensities for press bed work—so trying on the eyes—was only 8.3 foot-candles.

With two of the individual reflector lamps, as indicated on the sketch, the average illumination on the press bed was 18.2 foot-candles. For lighting the feed end of the press a glass steel diffuser fixture with a three-light 200-300-500-watt lamp is recommended. The 200-watt capacity would be used in normal running, the 300-watt for setting guides, vacuum cups, etc., and the 500 for make-ready operations on the cylinder. At the delivery end of the press is provided the same type of fixture, with the same lamps, but with daylight diffusing glassware so as to provide some daylight correction for color printing. This illumination can be considerably increased and made more uniform by painting the underside of the feed board white.



In range demonstrations Detroit Edison uses this meter to show the cost of cooking three meals for a family of six

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Winds up Greatest Year in Electric Range History

THE YEAR, 1935 *has been a real Santa Claus to those active in electric range merchandising. Public interest in electric cookery has swung into line and people the nation over have shown a lively desire for this modern method of cookery.*

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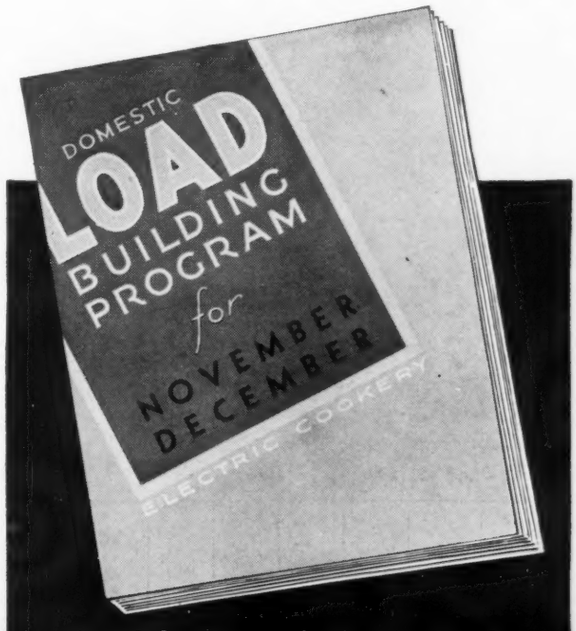
EDISON GENERAL ELECTRIC APPLIANCE CO., Inc.
5618 West Taylor Street, Chicago, Illinois



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Load-Building Methods —Ranges

Review of the Methods and Experience of 19 Power Companies Outstandingly Successful Last Year—How They Sell Ranges and What Results They Have Seen

RANGE sales are booming this year. Our recent check-up covering 100-odd companies, serving more than half the domestic consumers in the country, showed that the power companies had sold 68 per cent more ranges in the first six months of 1935 than in the same period of 1934. In the same cities the dealers sold 113 per cent more. The utilities had sold 39,214 and the dealers 14,494, while 5,825 had been put out on rental, a total of 59,533 connected for this half of the industry, with most of the summer selling still to come. Meanwhile range manufacturers are running behind their orders and some are increasing factory capacity. The long-delayed day when electric cooking would step out and win its place in the market is apparently at hand, thanks to all the influences that have brought us tumbling rates and a new urgent need for domestic load.

How are these ranges being sold? And what are the local conditions that have made them sell in those cities, where the biggest totals were rolled up, among this list of companies reviewed in the ELECTRICAL WORLD tabulation? The accompanying data give an interesting picture and provide a comparison of the average cooking rates and range saturation, average domestic consumption, revenue and appliance sales per consumer, sales over the past 5½ years and details of methods on nineteen systems, varying in size from 547,986 to 46,099 residence customers connected.

The study of these tables brings out several striking points. The average cooking rates among these companies are all favorable. One figures 3.3, another 3 cents, another 2.7, while seven are 2.5 and eight 2 cents or less. Electric ranges can be sold on their merits at 2½ cents or under where they can be sold at all. And in all these cities the gas competition is beatable, or they would not have rated in the upper 20, in total sales. Twelve of these companies provide service to some extent.

Sales promotion methods are likewise similar, in that these companies all follow the usual practices which

Range Sales by Nineteen Power Companies

A close-up of methods and results—comparing a group of companies which have led in load building in the last eighteen months

TABLE I

Company	Total Domestic Consumers Dec. 31, 1934	Av. Total Dom. Consumption June 30, 1935	Av. Revenue from Dom. Cons. 1934	Av. Cost per Kw.-Hr. to Dom. Customer-Cents	Av. Sales of Appl. per Cons. 1934	Present Sat. of Electric Ranges %	Range Sat. Among Co. Employees, %	Present Dom. Cooking Rates Aver.—Cents	Total Ranges Sold by Company						Total Ranges Sold By Dealers—Est.			% of Dealer Sales for 18 Months	Put Out On Rental		
									6 Mos. 1935	1934	1933	1932	1931	1930	6 Mos. 1935	1934	1933		6 Mos. 1935	1934	1933
A	547,986	575	$32.58	5.66	$1.18	6.3	67	2.5	3,696	3,456	2,766	1,920	4,191	4,944	590	125	100	9			
B	533,123	675	34.30	5.09	3.75	3.0	15	3.0	603	1,673	454	1,315	4,066	816	247	899	365	30	1,509		
C	527,185	726	32.57	4.48	.....	6.7	.....	2.0	709	1,150	1,273	(e)3,577	(e)4,270	(e)4,146	624	1,329	1,651	51	.....		
D	476,896	719	28.99	4.00	1.48	6.5	30	2.5	2,775	2,950	820	1,721	3,744	5,921	.....	250	.....	.....	.....	4,603	1,126
E	300,690	609	33.96	5.59	2.98	8.0	..	2.3	2,395	1,904	640	947	1,615	2,239	518	330	158	17	.....		
F	295,793	530	35.75	6.75	5.09	3.3	..	2.0	894	1,214	1,077	1,021	588	796	216	256	391	19	.....		
G	278,357	665	27.97	4.20	6.10	10.0	..	2.5	1,965	2,539	1,256	1,713	3,272	3,374	1,448	1,849	1,303	42	.....		
H	155,781	664	31.21	4.75	8.00	7.2	35	2.5	896	1,176	667	685	1,221	1,533	157	236	75	16	.....		
I	147,371	704	33.60	4.78	7.95	3.5	35	1.7	842	847	123	475	960	1,498	.....	100	85	.....	.....		
J	141,507	993	31.02	3.13	2.72	21.6	33	2.5	1,273	1,297	817	1,264	3,237	4,966	370	475	1,428	25	.....		
K	120,033	888	35.53	4.00	20.40	16.0	..	1.9	1,833	3,577	652	957	2,813	3,632	250	10	5	4	(e)42	(d)204	39%
L	94,271	774	31.96	4.13	19.35	15.9	..	1.8	2,258	3,810	1,079	606	1,207	1,796	424	399	100	12	78	135	.....
M	89,741	716	35.12	4.90	6.30	27.0	70	2.5	808	912	596	605	2,203	3,615	247	438	.....	28	.....		
N	75,416	871	33.44	3.85	15.20	18.1	..	2.0	1,125	1,269	318	608	1,377	2,529	236	262	10	17	(d)26	25	7%
O	67,430	797	54.21	6.81	6.57	17.4	65	2.0	447	1,309	396	547	482	582	900	1,471	649	57	.....	.....	.....
P	64,295	506	32.17	6.34	9.80	8.0	35	2.3	507	1,458	391	.....	.....	.....	32	125	50	7	.....	.....	.....
Q	52,715	680	40.00	5.88	15.75	18.0	..	2.5	1,257	1,293	582	.....	.....	.....	53	50	30	4	.....	.....	.....
R	49,588	587	35.41	6.04	15.15	11.0	45	2.7	477	846	641	.....	.....	.....	75	75	.....	10	.....	.....	.....
S	46,099	483	37.08	7.69	1.26	4.1	39	2.0	468	910	153	89	122	134	75	88	.....	10	.....	.....	.....
Total	4,064,277	(a)693	(a)34.57	(b)4.99	(a)8.28	(a)11.1	..	(a)2.3	25,228	33,590	14,701	18,050	35,368	42,521	6,462	8,767	6,400	(b)21	.....	.....	.....

(a)Straight line average. (b)Weighted average. (c)Net increase. (d)Net decrease. (e)Includes dealer sales also.

[Continued on page 71

the range manufacturers and the utilities have developed through the years. They advertise, they send out salesmen and demonstrators, they absorb the wiring cost, they finance time sales, they make some allowance on old ranges, they organize selling drives. Dealer co-operation takes natural forms, some cities more, some less complete, enthusiastic and effective. Salesmen's compensation, although expressed in divers ways, must all meet the level of competing salaries and be enough to hold good men. But there the similarity stops. The incongruities between the other factors are bewildering until you come at last to the natural conclusion.

What accounts for the best success in selling ranges among these companies? It isn't the rate, for Company E, that stands first in favorable rate, comes No. 6 in sales. Company B is

[*Continued on page 74*]

TABLE II

Company	No. Selling Ranges Average 1934		Consumers per Salesman	Compensation Paid to Range Salesmen	Does Company Pay for Wiring	Is Cost Added to Price	Does Co. Finance Time Sales	Maximum Time Given	Special Inducements Offered
	Salesmen	Service Women							
A	120	50	4,500	$110 monthly base salary. 15% on net sales plus yearly bonus	No	Yes	Yes	48 months	$15 on old ranges. Two weeks' trial
B	190	24	2,000	Base salary $65. Com. 11% on sales plus variable yearly bonus	Yes, av. $39	No	Yes	36 months	Rental part of 1935. Free utensils
C	44	2	12,000	Salary $80–$100 plus $16 on direct new sales or $8 on replacements or sales through dealers or $5 on multiple-family dwellings	Yes, $15–$35	Yes	Yes	18 to 24 months 36 on F.H.A.	Trade-in on competitive fuels—varied
D	16	16	5,000	16% commission with a $15 a week drawing account	Yes	No	Yes	24 months	6 months' trial
E	85	16	City 25,000 Rural 2,000 to 3 000	Salary $50 month plus 22% commission over $300 a month	Yes, $40	No	Yes	24 months	Trade-in $10 on old range
F	201	21	850 urban 1,850 rural	Salary $55 monthly plus $20 per range over 7 kw. or $17.50 under 7 kw.	Yes, up to $25	Part	Yes	24 months	No
G	125	12	No assigned territory	Straight com. 10% or salary $55 plus 6% and bonus over $1,200 sales per month	Yes	No	Yes Indirectly	36 months	Some 60-day trials. Trade-in
H	60	6	Not restricted	10% straight com., 4% bonus over $1,200 monthly sales. Load bonus $8 to $12 per range	Yes, up to $50	No	Yes	36 months	Trial where wiring is in. Some trade-ins
I	115	8	1,465	$50 monthly guarantee. 16% on cash sales, 15% on down payments, 14% on time contracts	Yes, av. $7.50	$7.50 installation charge	Yes	24 months	Free trial demon. Trade-ins $10 to $15
J	29	6	4,879	Straight salary average $130 monthly plus auto allowance 4½c a mile	No	Yes	Yes	24 months	Trade-in allowance $25 max.
K	177	55	300 to 2,000	Salary $55 to $65 a month plus 6% on sales price, plus $5 per range	Up to $50	No	Yes	36 months—48 mos. with ref. or water heater	Rental. Trade in $15
L	47	12	1,520	Salary $50 a month, 6% on net sales to $1,200, 10% above, plus 2% on down payment and $5 per range	Up to $50	No	Yes	36 months—48 mos. with ref. or water heater	Rental. Trade-in $25 max.
M	38	6	2,300	Salary $75 per month plus 5% up to $1,500 net sales, then 10% com. plus yearly bonus	Yes, av. $22.50	Yes	Yes	24 months	Trade-in 10% of new range in campaigns
N	29	14	1,200	Com. 5% on sales price plus $10 per range plus volume bonus plus down-payment bonus	Yes, $30–$50	No	Yes	24 months	Rental
O	42	18	1,800	Straight salary $125 to $175 a month plus campaign bonuses including dealer sales	No	No	Yes	18 to 24 mos.	Some 60-day trials. Small trade-ins during campaigns
P	35	7	1,800	Salary $25 a week plus 12% on sales over $800 a month	Yes, up to $50	No	Yes	36 months	None
Q	30	3	1,700	Salary $45 a month plus $13.50 bonus on all ranges except replacements	No	Yes	Yes	24 months	Trade-in $10
R	30	11	750	Salary $60 plus 10% com. on ranges sold	Yes	No	Yes	30 months	Trial—Trade-in $15. Set of utensils added to price
S	29	9	1,200–1,600	Salary $25 plus 10% on sales over salary, plus $10 per range	Yes, av. $50	No	Yes	36 months	60-day free trial

TABLE III

Company	Appropriation for Range Promotion	Extent of Promotion Program	Dealer Co-operation Provided
A	$60,000	Newspaper and mail adv., billboards, cooking schools demonstrations	Finance, some trade-ins, home service, adv. material, sales training. Com. to company salesmen on dealer sales
B		Continuous promotion-periodic campaigns	Finance. Demonstrations. Bonus—$8 on rental, $6 when converted to sale. Sales training and adv. through local association
C	General	Extensive continuous sales with campaigns	Elec. Appl. Asso. set-up. Advertising support and material. Sales training. Demonstrations. Wiring allowance
D	$35 per range	Varied program on scale to sell 5,000 ranges in 1935	Help with sales training. Bonus on load
E		Five-year program started 4/1/34 with extensive advertising	Finance, advertising, free wiring, home service, sales training, bonus of 1 range free for each 5 sold
F	No separate appro.	Continuous promotion—newspaper, mail adv. campaigns	Feature dealers in adv. Sales training. Pay wiring up to $25.
G	No separate appro.	Two 6-weeks' campaigns a year, with low price leader. Extensive adv.	Finance, co-op. advertising, cooking schools, sales help. Regular salesmen's com. paid to dealer
H		Continuous full promotion with periodic campaigns	Educational adv. sales training, bonus on load. Contact man assists
I	$42,000	39 cooking schools, adv. mail and 80 newspapers. Home service	Adv. "Buy from Dealer." Provide adv. material, sales and engineering aid. Sales training
J	No separate appro.	Continuous selling. Cooking schools, demonstrations, adv.	Adv. features dealer. Sales training. Home service. Dealer cooking schools
K	Gen. approp. 3½%	3 yearly campaigns by all salesmen. Employees paid $1 for prospects sold	Finance, if desired. Adv. material, sales help. Home demonstrations. Service ranges during guarantee at small charge
L	6% of est. sales	Newspaper and mail adv. Radio. Billboards	Co-op. adv. Help in sales. Home service. Pay bonus same as company salesmen. Pay Company salesmen on dealer sales
M	$31,000 for ranges and water heaters	Continuous with campaign periods	Tie into advertising. Help with sales planning and training. Full-time contact men
N		Part of general program. Newspaper, mail adv., employee sales contests. Home service	Cooking schools. Sales training. Specialists give aid. Bonus on dealer sales
O	No separate appro.	Three intensive campaigns each year each 8 weeks. Extensive adv.	Finance. Co-operative adv. featuring dealers—newspaper and billboards. Sales training. Four men help
P		Part of general program, with total appropriation of $35,000	Finance. Adv. dealers' names. Window displays and use of store. Sales training
Q		Periodic campaigns. 1935 quota 1,600	Adv. features dealers. Sales aid through co-ordinators. Pay Company salesmen bonus on dealer sales. Home service
R		Newspaper adv. Radio broadcasts. Home service	Adv. over dealer and company names. Sales training. Demonstrations.
S		9 mos. campaign each year. Cooking schools. Employee drives, diversified adv. display	Adv. support. Sales training. Price level adequate for dealer

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The Electromaster Waldorf is a big smartly styled buffet-type range completely finished in genuine porcelain enamel and chromium plate. Surface units, switches, direct no-relay thermostat, and all other vital parts are as outstanding in design and efficiency as the *Mono-Unit* oven! Complete information regarding the Electromaster Waldorf and Electromaster's modern range merchandising plans will be furnished upon request.

R · INC. *Detroit, Michigan* . . .

second in favorable rate, but comes No. 10 in sales and No. 7 in sales plus rentals. Company R, third in favorable rate, comes No. 15 in sales plus rentals. And it isn't the number of men and women who are selling either, for Company K, standing first in personnel, comes No. 4 in sales. Company F, standing second in personnel, comes No. 11 in sales. And Company B, third in number of salesmen and home service women working on range load, comes No. 10 in sales and No. 7 in sales plus rentals. In terms of size, Company A, with the largest number of domestic consumers, stands No. 1 in sales and No. 2 in sales plus rentals, but beyond this the natural influence of size falls down, for Company B, second in size, comes No. 10 in sales and No. 7 in sales plus rentals, and Company C, third in size, comes No. 14 in sales.

No uniformity

But Company A, largest in sales and in size and second in sales plus rentals, stands No. 16 in average annual consumption, No. 5 in average domestic revenue, No. 18 in average appliance sales per consumer, No. 14 in saturation of ranges, No. 2 in saturation among employees, No. 4 in rate, No. 5 in number of salesmen and No. 2 in home service women. Company L, second in sales and third in sales plus rentals, stands No. 13 in total consumers, No. 5 in average annual consumption, No. 15 in average revenue, No. 2 in appliance sales, No. 7 in range saturation, No. 8 in cooking rate, No. 9 in salesmen and No. 8 in home service staff. And so it goes with the rest, as a little study of the tabulation shows.

There is no uniformity in present practice or in the results that are being obtained in building range load. Most companies are paying for range wiring to remove this serious obstacle to sales. The cost naturally differs with the locality. Four companies pay up to $50. One averages $50. Others allow $7.50, $15, $22.50, though general adoption of an inexpensive hookup would, it would seem, bring lower costs and greater similarity of wiring allowance. In the matter of maximum time extended on deferred payments sales, nine companies give 24 months and eight give 36 months. Nine companies assign their range salesmen to cover from 1,200 to 2,300 domestic consumers, but the rest are all over the lot, as high as 20,000 and as low as 750 and 300. The same men sell water heaters also and quotas are set according to the ability of the man and the possibilities of the territory.

But with the uniformity of rate and a wide open market in each case, as indicated by the low saturation, how do we account for the fact that Company G sold in the last eighteen months 4,502 ranges with 125 salesmen and twelve service women, while Company E sold 4,299 with 85 salesmen and sixteen women? Also, Company J sold 2,570 ranges with 85 men and six women, while Company Q sold 2,550 with 30 men and three girls. Also, Company F sold 2,108 ranges with 201 men and 21 girls, while Company H put out 2,101, including 35 rentals, with 60 men and six women, and Company P put out 2,000, including 35 rentals, with 35 salesmen and a home service staff of seven. And again, Company I put out 1,724 ranges, including 35 rentals, with 115 salesmen and eight women, while Company S put 1,417 on the lines, including 39 rentals, with 29 men and nine girls.

There is only one answer and the same that accounts for the varying proportion of dealer sales. The total dealer sales in these twenty cities figure 21 per cent of the total over the past eighteen months, but on the individual systems dealers sell all the way from 57 to 4 per cent. The difference lies in the selling job that is being done.

Most companies today that have started range selling at all are going through most of the motions. But the wide disparity of results obtained is due to the effectiveness with which they have organized and the intensity of their operations. And this does not mean man-power alone nor yet the appropriation of money. It means the combination of adequate money and man-power, with thorough, expert and enthusiastic organization, guided by accurate sales control and supported by persistent sales training, unremitting promotion and advertising and a co-operative trade policy that builds up active and successful dealer selling.

Cooking is continuous in every home and range selling should never stop, though it can be stimulated by periodic feature campaigns. Cooking is universal, therefore the general use of the electric range by company officials and employees is vital, for how can electrical men promote electric cooking unless they use it themselves? And why should the public believe in it, if utility men and dealers themselves cook some other way?

The building of a large domestic load by range sales is within the reach of almost every power company today. Cooking rates are now available to nearly 85 per cent of all consumers. Gas rates so low that electric cooking is salable only as a luxury to a small minority of homes prevail in relatively few cities. The market is ready. It is only inadequate selling that holds it back.

Now sell them fast

There is a tradition in the industry that electric ranges must sell slowly, and they have for a third of a century. But the time has come now for selling them fast. And this can and will be done as soon as the local experimenting stops and the power companies pool their experience and put the pressure of a complete sales program behind electric cooking. It may mean the increase of sales personnel ten times and ten times the expenditure of money, in definitely planned budgets that are not just part of a general advertising expenditure, as is so often the case today. But it would mean the sale of not 200,000 ranges in the next twelve months, but 500,000, and a million the year after.

The electric refrigerator won its popularity because $25,000,000 was spent in its promotion in a period of five years. And that is all that is needed to put over the electric range and make it the standard in the modern American home. And how much more quickly range load pays for its cost.

If the experience of these nineteen companies and the records of so many more have any significance, it means one thing. Ranges must be sold by every utility—with all the resources that the knowledge of the manufacturers and the most successful companies can suggest. If rental opens doors, all should rent or give an equivalent in terms. If free wiring breaks down resistance, why should all not take advantage of it? If financing dealer sales helps build up volume for the trade, it should not be overlooked by anybody. And if electric cooking is now practical for normal American families, then enough money and sufficient man-power should be organized behind it by manufacturers and power companies to put the idea across and the load on the lines—not some day, but at once.

High-Voltage Bushings Tested in Place

[*Continued from page 30*]

tested during this operation and renewed if necessary.

If readings after this localizing procedure were still considered abnormal, the conclusion was drawn that the bushing itself was at fault, and it was removed from service for examination and repairs.

Defects localized by test

In the event of readings considered abnormal being obtained from both of operations (4) and (5), the conclusion was drawn that a faulty condition existed either in the oil or in both bushings and steps to localize the condition were taken as follows:

11. The oil was dropped to eliminate it from the test and power-factor readings taken.
12. (a) If both bushings showed abnormal readings after operation (11), each bushing was given the procedure under (8), (9) and (10). (b) If both bushings showed normal readings after operation (11), power-factor and dielectric breakdown tests were made on samples of the oil.

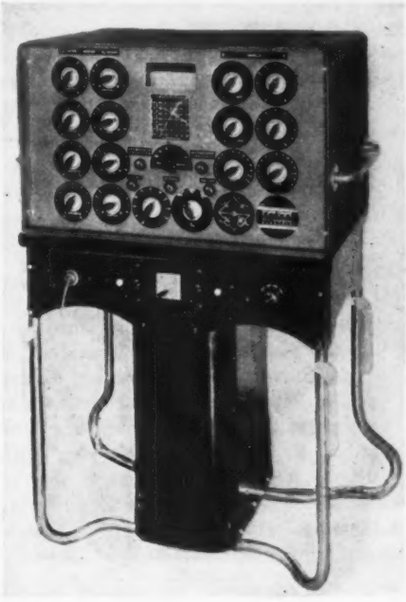
If normal readings were obtained from both operations (4) and (5) and a reading considered abnormal was then obtained from operation (6), the conclusion was drawn that some other insulating member, such as lift rod or guide, was at fault. Losses through such members are generally confined to surface leakage caused by deposits and are ordinarily eliminated by cleaning. Accordingly, the procedure in such cases was as follows:

13. Oil in the tank was lowered until all of the members in question were exposed and they were tested with a megger.
14. Members were thoroughly cleaned, examined and the megger test repeated.
15. Power-factor test, operation (6), was repeated.

Although it did not occur during these tests, had the abnormal readings persisted after operation (15) the conclusion would have been drawn that one of the members contained some internal fault and the procedure would have been to eliminate them one at a time until the faulty member was located and replaced.

Procedure simpler for transformers

In the case of transformers the testing procedure was somewhat simpler, an inherent characteristic of the portable power-factor bridge being utilized to carry out these tests with a minimum of time and expense. These bushings were all of the tubular conductor type with a lead from transformer winding "fished through" the bushing central tube. After breaking the line connection the top cap of the bushing was removed and the winding lead insulated from the bushing central tube. The winding lead was connected to the shielding circuit of the power-factor bridge and the bushing central tube to the bridge circuit. Since the shielding circuit and the bridge circuit are at the same potential, a small amount of insulation between the winding lead and the bushing central tube is sufficient to give satisfactory results. In most cases the winding lead was taped through the bushing with a layer of cloth tape, which proved quite satisfactory for the test. Untaped winding leads were insulated from the bushing central tube by slipping a micarta tubing of $\frac{1}{8}$-in. wall thickness over the winding lead for the full length of the bushing, as shown in the illustration on page 30. The test procedure in general was as follows, going over each bushing in turn:



Power-factor test set in portable form

1. With the winding lead connected to the shielding circuit and the bushing central tube to the bridge circuit as previously described, the power-factor and capacitance values of the bushing were recorded.
2. In cases where readings from operation (1) were considered abnormal the porcelain weather casing was shielded to eliminate the effect of surface leakage and the readings repeated.
3. If the readings from operation (2) were still unsatisfactory the tank was opened, the lower end of the bushing cleaned and readings taken once more.

If the abnormal readings still persisted after operation (3), the fault was considered to lie in the bushing itself and it was removed from service for examination and repairs.

Extra shielding for high voltage

As the tests were extended to 220-kv. apparatus extra shielding precautions were found necessary under certain conditions. The electrostatic charge from live overhead lines upon the bushing, as isolated for test, was intense enough in some cases to cause errors in the readings. Where the live lines were approximately 11 ft. above the top of the bushings there was considerable interference and shielding became necessary, while at a height of 27 ft. above the bushings the interference was negligible and no shielding was applied. The intensity of line interference was readily detected by the unbalanced condition of the power-factor bridge before potential was applied and was eliminated by use of a metal screen bonnet made up for the purpose in the field. With the exception of one 154-kv. circuit breaker where the overhead lines were lower than usual, this additional shielding was used only on 220-kv. apparatus. Later experience indicates that in cases where the electrostatic charge is not too great a reasonably accurate power-factor reading may be obtained by taking the average of two readings, one taken in the regular way and one with the 110-volt supply leads reversed on the terminals.

In general, it may be said that, aside from a wholesale dismantling and transportation of service apparatus to a central laboratory, the power-factor test represents the only means of obtaining complete information as to the condition of insulating mediums in service. By its use tests can be made conveniently on apparatus in place and data obtained which will reveal hazardous conditions and permit a remedy before failure occurs. The portable power-factor bridge used on these tests was manufactured by the Westinghouse Electric & Manufacturing Company. A Westinghouse engineer also supervised its operation. The remainder of the investigation was carried out by members of the personnel of the Pacific Gas & Electric Company.

MEN OF THE INDUSTRY

Dr. Wickenden Awarded Lamme Medal by S.P.E.E.

W. E. Wickenden, president of the Case School of Applied Science, Cleveland, Ohio, has been awarded the Lamme Medal of the Society for the Promotion of Engineering Education. After serving on the teaching staff of the Rochester Mechanics Institute, the University of Wisconsin and Massachusetts Institute of Technology, Dr. Wickenden became

W. E. Wickenden

supervisor of educational work for the engineering department of the Western Electric Company, New York, in 1917, and the next year, manager of the company's personnel committee. He later became chairman of the company's personnel committee.

He joined the American Telephone & Telegraph Company, New York, in 1921, as assistant vice-president in charge of the recruiting and development of supervisory and technical personnel for the Bell system. Between 1923 and 1929, he was director of investigation for the Society for the Promotion of Engineering Education, and since 1929 has been president of Case School of Applied Science. Dr. Wickenden was president of the S.P.E.E. during 1933-1934.

•

▶ D. H. LEWIS, general manager St. Louis county division, Union Electric Light & Power Company, Webster Groves, Mo., has been elected vice-president in charge of suburban operations.

▶ WILLIAM LUTHJOHN, superintendent of the range division of the Minnesota Power & Light Company since 1928 and associated with its predecessors since 1915, has been named division manager at Eveleth, succeeding E. A. Kefgen. Mr. Kefgen will be succeeded as division superintendent by H. T. Reifel, who has been with the organization since 1923 and recently secretary of its general safety committee.

▶ A. K. JONES, formerly vice-president and general manager Cia. Cubana de Electricidad, Inc., Havana, Cuba, is now connected with Cia. Chilena de Electricidad, Ltd., Santiago, Chile.

▶ ERICH FETZ has joined the metallurgical staff of the Wilbur B. Driver Company, Newark, N. J., as research metallurgist. Mr. Fetz has had extended metallurgical experience in this country and abroad.

▶ W. Y. BLANNING, JR., who has been serving as director of the bureau of public convenience for the Pennsylvania Public Service Commission, has been appointed secretary of that body, to succeed the late Louis Tevell.

▶ CLEMENT C. WILLIAMS, formerly dean of the college of engineering, University of Iowa, has been elected president of Lehigh University. His earlier experience was in engineering education at the University of Colorado and the University of Kansas. Last year Mr. Williams served as president of the Society for the Promotion of Engineering Education. He is the author of several engineering text books.

▶ W. C. LOUNSBURY, manager of the Superior Water, Light & Power Company and general manager of the Northern Power Company, Superior, Wis., since 1918, has been transferred to Duluth, Minn., to become one of the executives of the Minnesota Power & Light Company, and among other assignments will have charge of that company's safety program. Mr. Lounsbury is a former president of the Wisconsin Utilities Association and was also vice-president of the Wisconsin Society of Engineers.

▶ R. W. SORENSEN, senior professor of electrical engineering at California Institute of Technology, Pasadena, was honored at a special meeting held recently in that city attended by 120 engineers, scientists, educators and city officials. A hand-illuminated parchment testimonial was among the gifts bestowed upon him and a scroll was presented to him by officers of the Los Angeles section of the American Institute of Electrical Engineers. The occasion marked 25 years of service given by Professor Sorenson to California Institute of Technology. Professor Sorensen is a fellow and past-vice-president of the A.I.E.E.

James Burke Made President of Electrotechnical Group

James Burke, a member of the United States National Committee of the International Electrotechnical Commission, was unanimously elected president of the commission at the recent meeting of the plenary session held in Brussels, Belgium. He is succeeding Dr. A. F. Enstrom of Sweden. For many years he has been a member of the U. S. Na-

James Burke

tional Committee and has made valuable contributions both to the work of that body and to the I.E.C.

Mr. Burke is widely known as an inventor. His patents include designs for a generator winding by which three-wire service from a single machine was made possible and a motor for operation on either a.c. or d.c. supply. He served on the U. S. National Committee as representative of the National Electrical Manufacturers' Association from 1914 to 1930 and as representative of the American Institute of Electrical Engineers from 1930 to 1932. He recently retired from the Burke Electric Company of Erie, Pa., of which he was chairman of the board, after more than 30 years as active head of the company (ELECTRICAL WORLD, June 8, page 88).

•

▶ GEORGE N. BROWN, formerly connected with the sales department of Kelvinator Corporation, is now associated with the Moloney Electric Company, with headquarters in New York. For three years prior to joining Kelvinator staff last December Mr. Brown served as manager of the electric refrigeration bureau of the Edison Electric Institute. In the course of his career Mr. Brown spent eight years with the Pittsburgh Transformer Company, during the last four of which he was vice-president in charge of sales. When this company

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TYPE 27FPG
(1040 A.H.)

PHILCO STEEL◈GLASS BATTERIES

The first requisite of power battery equipment is dependability. Philco Steel-Glass Batteries are noted for being dependable—a reputation earned by over a quarter of a century of experience in building quality batteries.

Steel-Glass is of high sustained voltage and capacity—compact and spray-proof—easy to install and maintain—and guaranteed to give EXTRA YEARS of service with lowest operating costs. Once installed, Philco's Engineering Inspection Service periodically insures absolute reliability and economy.

Philco's exact balancing of Electrical and Mechanical perfection makes Steel-Glass the perfect battery for central and sub-station operation. Its "anchored-in-glass" assembly eliminates shifted or punctured separators, dropped or buckled plates and resulting "low cells" found in conventional types.

Your old battery will command a liberal allowance toward any Steel-Glass cell from 10 A.H. to 1040 A.H. Write today for Catalog 2440-A and get the complete story of Philco's contribution to dependable battery operation.

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PHILCO DIAMOND◈GRID *Batteries*

X SUPER-POWER AUTO BATTERIES

Modern, multi-plate, long-life . . . POWER for EVERYTHING—quick starting, safer, brighter lights, powerful auto radio, snappy accessory operation . . . that's X SUPER-POWER! Get YOUR Philco X SUPER-POWER Battery and be sure of perfect performance and reliability *every day!* Also available for all makes of trucks and buses.

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was sold to the Allis-Chalmers Manufacturing Company in 1927 he became manager of insulator sales for the Ohio Brass Company. This position he occupied until joining the Edison Electric Institute in 1931.

•

H. J. Underhill Assumes New Executive Duties

Howard J. Underhill, who since 1907 has been associated with the Minnesota Power & Light Company and its predecessor companies, and since 1927 division manager at Duluth, has been elected vice-

H. J. Underhill

president and general manager of the Superior Water, Light & Power Company and the Northern Power Company of Superior, Wis. Mr. Underhill succeeds W. C. Lounsbury, manager of these companies, who has been transferred to Duluth.

Mr. Underhill has had wide experience in the public utility field. Engaging first on construction work, he later entered the operating end, becoming general superintendent of the Minnesota Power & Light Company when that company and a number of other public utility companies were consolidated in 1923. Four years later he was named division manager at Duluth. Mr. Underhill has taken a prominent part in civic affairs not only in Duluth but in the other communities where he has resided and has been active in the work of the North Central Electric Association.

•

▶ D. W. Reeves, formerly superintendent of sales, Gulf States Utilities Company, Lake Charles, La., is now power engineer at Beaumont, Tex.

▶ Donald L. Bower, formerly assistant to the executive engineer of the National Resources Board and assistant secretary of the Mississippi Valley Committee, has joined the staff of the United States Engineer office at Elmira, N. Y. Mr. Bower is connected with the Corps of Engineers of the War Department working on the survey of the area in New York and Pennsylvania which suffered from a recent disastrous flood. This work is under the direction of Captain Lester F. Rhodes, U.S.A., and Mr. Bower has been designated to take charge of the damage survey.

▶ Frank B. Rae, Jr., has been engaged as sales promotion consultant by Curtis Lighting, Inc., of Chicago. Mr. Rae is widely known in the lighting field. He was at one time advertising manager of Holophane Company and spent nine years as advertising counsel for the F. W. Wakefield Brass Company, Cleveland. He is at present editor of *Better Light-Better Sight News*, issued under the sponsorship of the Edison Electric Institute, and is also contributing editor of *Electrical Merchandising*, a McGraw-Hill publication.

▶ Nelson J. Darling, manager of the River Works of the General Electric Company at Lynn, Mass., has been appointed general manager of all the company's manufacturing facilities in that city. He has jurisdiction over both the River Works and West Lynn factories, following the retirement on September 1 of Frank P. Cox as manager of the latter plant. Nicholas M. DuChemin, general superintendent of the West Lynn factory, has been promoted to assistant manager of that establishment, and William G. Mitchell will be continued as assistant manager at the River Works, with enlarged duties.

•

G. A. Riley of Los Angeles Receives Promotion

George A. Riley has been appointed superintendent of electric distribution of the Los Angeles Gas & Electric Corporation, Los Angeles, Calif., to succeed E. R. Northmore, who retired from

G. A. Riley

service after 42 years with the corporation. Mr. Riley is also a veteran in the organization, having joined the staff in March, 1905.

First employed in the electrical distribution department as a groundman, Mr. Riley held various positions until February, 1924, when he was appointed assistant superintendent of electric distribution, which position he held until appointed superintendent to succeed Mr. Northmore. Positions he held previously included foreman of the meter test department, foreman of substation design and construction and electrical engineer, overhead department. L. A. Buese, formerly electrical protection engineer, becomes assistant superintendent of electric distribution, while G. M. Babcock steps into Mr. Buese's former position, and J. C. McClung becomes overhead electrical engineer.

•

▶ R. H. Dearborn, head of the department of electrical engineering and since 1933 acting dean of the school of engineering and industrial arts at Oregon State College, Corvallis, has been appointed dean. In addition to his academic work, Dean Dearborn served as electrical engineer for the Public Service Commission of Oregon from 1913 to 1915.

OBITUARY

O. F. Junggren

Oscar F. Junggren, famous for his work in the development of steam turbines, died at his home in Schenectady, N. Y., after a long illness. He was 70 years of age. One of the outstanding engineers of the country, Mr. Junggren was with the General Electric Company for 44 years. A pioneer in the designing and development of steam power equipment, he worked with W. L. R. Emmet, chief engineer, in the designing and construction of the first large Curtis turbine, completed in 1903. This 5,000-kw. machine was the forerunner of the giant electric power producers in general use today. Appointed design engineer of General Electric's turbine department in 1907, Mr. Junggren continued in that position until 1922, when he was appointed consulting engineer of the department. Until his illness in 1934 he devoted his entire time to increasing efficiency in electric power generation. Mr. Junggren had more than 130 patents to his credit and in the eight years from 1924 to 1932 he developed thirty steam turbines, all of them of different and outstanding design. His contributions to the electrical industry won for him in 1931 the Charles A. Coffin award. Mr. Junggren was born and educated in Sweden.

▶ Henry H. Tinkham, public relations director for Consumers Power Company, Jackson, Mich., since 1921 and formerly newspaper man of statewide repute, died September 12, from a heart ailment, after an illness of several months. Mr. Tinkham became affiliated with the power company after a long career in newspaper work. He was 56 years of age.

Burroughs

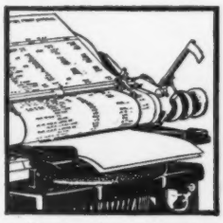
AUTOMATIC TYPEWRITER BOOKKEEPING MACHINE

A Distinct Advance in the Speed, Ease and Economy of Mechanical Accounting

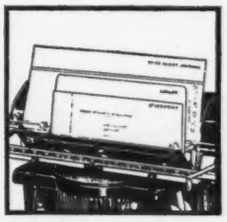
This new Burroughs is the fastest machine of its kind ever built. It has many automatic features that speed and simplify its operation. Even subtraction of credits is now automatic.

To reduce accounting costs, investigate this machine. Note the features below and consider their advantages. For a complete demonstration, telephone the local Burroughs office.

Keyboards—typewriter and adding machine—are compact and convenient for efficient operation.

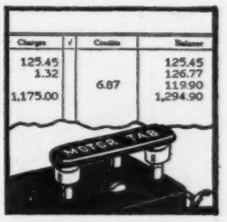


A flat surface for quick insertion and accurate alignment of forms.

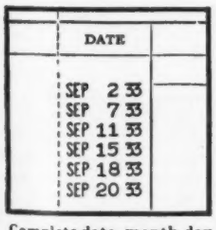


Cylinder platen and electrically controlled carriage for speed—fastest means of mechanical posting.

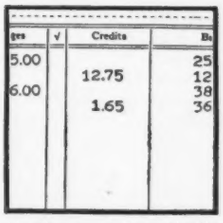
Automatic decimal tabulation and punctuation: dollars under dollars, cents under cents.



Depression of this bar operates the machine and automatically tabulates the carriage to next position.

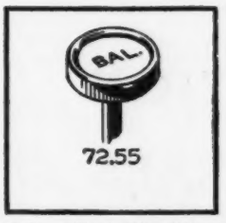


Complete date, month, day and year, automatically printed in proper column with each posting.



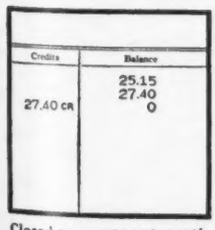
Credits are automatically subtracted and printed in red. The Subtract Key is for manual subtraction.

A correction of an error is easily made before an amount is printed or computed, by depressing this key.



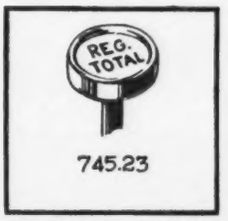
Balance Key is "live," that is, one depression prints the balance, tabulates carriage to next position and spaces journal.

A single depression of this key prints a credit balance (in red) and designates it with the symbol "CR."



Closed accounts automatically designated. Eliminates possibility of carrying forward a previous balance.

Electric return of carriage speeds the work and lessens operator fatigue.



A single depression of this key prints register totals and tabulates carriage to next position. No copying, figure by figure, from dials.

In case of a sales tax the amount is printed in the charge column and identified by a single key depression.

A fast electric, adding, listing and subtracting machine for proof-listing and all general addition.

BURROUGHS ADDING MACHINE COMPANY · DETROIT, MICHIGAN

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PHENOL FIBRE
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VULCANIZED FIBRE
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TAYLOR INSULATION
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SILENT GEARS
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BOOK REVIEWS

The Life and Letters of Sebastian Ziani De Ferranti

By Gertrude Ziani De Ferranti and Richard Inch. Published by Messrs. Williams & Norgate, Ltd., 28-30 Little Russell Street, London W. C. 1, England. 236 pages, illustrated. Price, 12s 6d.

Characteristic abominable spelling of the engineer, whether he be embryo or mature, marks the boyhood letters which teemed with the inventive notions of Sebastian de Ferranti about steam engines and dynamos. Sketches of these enliven the pages. He patented an alternator at 17. At 18 he was engineer of the firm formed to exploit it. Trouble in handling its high voltage led to the concentric main idea, less a distribution heresy now. Out of these ideas grew the London Electric Supply Corporation and the Deptford power station (1888), forerunner of the universal a.c. system and the Grid.

Ferranti seems never to have vacationed from things electrical—on his wedding tour he was buying Swiss gears for his meter register. Throughout his life he had visions of things to come and he saw what we see. In 1910 he talked of electric heat to force plant growth, sure it would be cheap enough some day. He insisted upon a.c. and 10,000 volts when one-fifth as much was plenty for others. No firmer example of success crowning tenacity is likely to be set to print than that which marked Dr. Ferranti's career. He had it as youthful inventor, operator and manufacturer. The book is a very humanly written inspiration as well as a history of an era.

•

Electric Wiring

By W. S. Ibbetson. Published by E. & F. N. Spon, Ltd., 57 Haymarket, S.W.1, London. New York: Engineers Book Shop, 227 Park Avenue. 248 pages. Ill. Price $2.00.

Although founded on British wiring regulations, this book will aid any wireman to grasp the reasons for certain rules and the practices prescribed. Five chapters on fundamental electric principles are followed by six on wiring devices and their installation and by two more on splicing and testing for faults. The remainder discuss illumination and battery installations, ending with generator and motor wiring and control principles and practice. There are quite a few numerical problems solved.

•

Electrician Annual Tables of Electricity Undertakings, 1935

Forty-eighth annual edition. Published by Benn Brothers, Ltd., Bouverie House, Fleet Street, London, E.C.4. 250 pages. Price, 10s net.

For those familiar with previous editions of this excellent compilation the new one calls for little comment, except that it comes in a modernized and attractive type-face, and that it includes a history of the national grid, together with a full-page map (9¾ x 12 inches) showing the location of stations and transmission lines. The statistical information regarding each undertaking goes into much detail as to equipment, operating and service voltages, rates and number of consumers. British enterprises take 178 pages, Dominion and Colonial 48, various foreign ones the remainder of the book.

Theory of Alternating Current Wave-Forms

By Philip Kemp. Published by the Instruments Publishing Company, 1117 Wolfendale Street, Pittsburgh, Pa. 229 pages, illustrated. Price, $4.50.

Technique of wave analysis which is assembled here has been partly available but widely scattered in literature. The book emanates from the Polytechnic, London, and is the "theory" volume to be followed by "practice" volume II. In the section on properties of complex waves there is developed, for instance, the criteria for resonance in considerable detail; a simple graphical construction is provided for the relation of components to one another and to the equivalent sine wave.

Deformation coefficients are determined and filters for ripples and passes discussed in detail. Power cyclograms for complex waves are another inclusion. In treating the effects of iron the permeability and hysteresis components are segregated. Distortion, cyclically varying resistance, negative coefficients, corona, pulsating capacitance are other topics. The last quarter of the book deals with polyphase system harmonics (including oscillating neutral, unbalanced stars, conversion and transformation meshes and the problem of general polyphase power factor) and the procedure in Fourier analysis and evaluation of the constituents.

•

Worked Examples in Electrotechnics—Part I

By H. Turner Aspinall. Published by E. & F. N. Spon, Ltd., 57 Haymarket, S.W. 1, London. New York: Engineers Book Shop, 227 Park Avenue. Illustrated. Price, $1.75.

Complete numerical solutions are given for 110 typical examination questions of simple character in the field of circuits, heating, electrolysis, solenoids, magnets, generators, motors and instruments. Samples are given of entire South African examinations. Four place logarithm tables are provided, as is a collection of formulas. Helpful in preparation for registration and licensing.

•

Generating Stations

By Alfred H. Lovell. Published by McGraw-Hill Book Company, 330 West 42d Street, New York. 438 pages, illustrated. Price, $4.50.

Between the technique of financing a generating station project and disposing of its output to transmission and distribution systems lies a chain of principles and practices which this book covers. It does so with authority because the author builds his case treatment upon technical literature, with most profuse reference to ELECTRICAL WORLD articles and data on design, costs, standard operating practice and performance results. Economic decay is what the author cites as embracing depreciation, inadequacy and obsolescence. Mathemetical tests are set up and illustrations worked in justification of supersessions. Load scheduling, growth analyses, reserves, load division are treated graphically and formulatively.

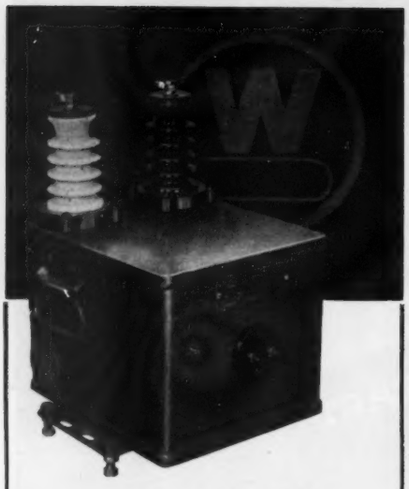
Economics of distribution, conductors and cables are given a chapter preliminary to discussion of plant location relative to load centers. Bus systems are treated rather briefly, although short circuits, reactors and breakers are given proportionately more consideration. Chapters on relays and synchronous condensers close the book, which is well framed for students and for station design and operating engineers who want a convenient collation of recognized experience as to layouts and their economic results.

ORANGEBURG FIBRE CONDUIT — *time-tested in 42 years' service*

The three essentials of an underground conduit are inherent in Orangeburg

The Fibre Conduit Company • ORANGEBURG, N. Y.

SALES AGENTS: GRAYBAR ELECTRIC COMPANY • GENERAL ELECTRIC SUPPLY CORPORATION



DRY-TYPE

Indoor Potential

Transformers

The primary coils of the type PT indoor potential transformer are wound on a Moidarta spool, shielded by Micarta barriers, and impregnated with the same high-strength insulating compound with which the rugged sheet-steel case is filled. This construction results in a mechanical and insulation strength considerably higher than any previous design.

Other features are:

1. Coordinated insulation—Surges flash over the bushings and thus cannot harm the windings.

2. Small size—The 13,800-volt transformer, for example, is only 10¼ x 12 x 14½ inches high.

3. High accuracy—The ratio changes less than one per cent from zero to full load. Transformer is so compensated that from zero to fifty per cent of nameplate rating the ratio error will not be more than ¼ of one per cent.

4. Long life—Transformer case is solidly filled with a new insulating compound that will not deteriorate with age.

Type PT transformers are available in ratings up to 13,800 volts.

R 59016

Westinghouse

DRY-TYPE TRANSFORMERS

Protection for 13-kv. Switches

[*Continued from page 28*]

operations with a maximum of 41 operations for a single switch. Therefore it appears that these insulators have adequate mechanical strength.

Another method of switch protection being tried, but one with which little operating experience has been obtained, involves tube-type protectors. Installations of General Electric expulsion tubes and Westinghouse Deïon tubes were made late in the 1934 lightning season. Five switches were protected using three tubes per switch at a cost only slightly above that for phase isolation. These methods of protection cost approximately one-third as much as using three conventional-type lightning arresters per switch. Where six arresters or tubes are needed, as in the case of normally open switches, the cost is considerably more than for phase isolation.

To gain broader and more conclusive operating experience, it is planned to increase the total number of phase-isolated switches to 176 and tube-protected switches to 27 in 1935.

It should be appreciated that the foregoing is primarily a progress report based on limited operating experience and has been prepared chiefly with the hope that it will stimulate thought on this problem among other companies.

•

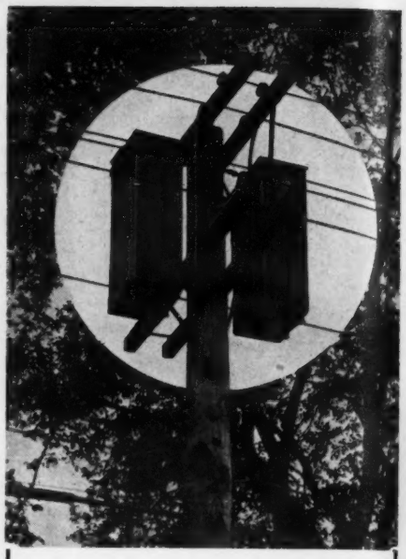
Foster Wheeler Cuts Losses

For the six months ended June 30 Foster-Wheeler Corporation, including English and French subsidiaries, reports net loss of $151,313, after charges, taxes and depreciation, compared with net loss of $460,125 in first half of last year.

•

Air Conditioning Centered At Springfield Works

Westinghouse Electric & Manufacturing Company will center its manufacture of air-conditioning equipment at its East Springfield, Mass., works, because of the close relation between that and the refrigeration production. A staff of engineers on air conditioning is being transferred from East Pittsburgh, where the air-conditioning production was for the most part carried on, and transfer of manufacturing in that line will follow. In making this announcement Westinghouse officials expressed confidence that air conditioning would grow to large proportions in a few years.



. . . *prevent*

LOW VOLTAGE

on

RURAL LINES

At low cost, you can now prevent low voltage on rural lines, with its resultant loss of revenue and customer goodwill.

Simple, inexpensive, and reliable, the Westinghouse BR Booster maintains reasonably normal voltage on rural lines . . . even during periods of peak demand. It provides a boost of 5% or 10% when voltage drops below a predetermined level.

Easily and quickly installed . . . requiring only a small initial investment . . . and needing practically no attention or maintenance . . . this automatically controlled booster will pay for itself in a surprisingly short time through increased revenue from existing loads and stimulated use of load-building equipment.

R 59026

Westinghouse

The New

BR BOOSTER

THE *New* CLIP-ON AMMETER

by Ferranti

Showing the simplicity of the Ferranti Clip-On Ammeter in actual use.

OFFERING *23 important features*

Thousands

SAVE

TIME and MONEY

USING THE

FERRANTI DUAL RANGE CLIP-ON AMMETER

0—100 amps
0—500 amps
$65 TWO RANGES IN ONE SELF-CONTAINED INSTRUMENT

Sold, guaranteed and serviced in the U. S. A. by the manufacturer

FERRANTI ELECTRIC, INC.
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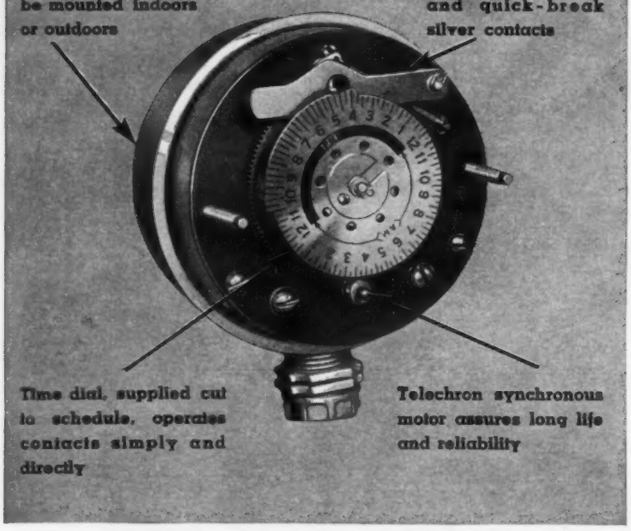
Send for this **NEW BOOKLET**

CONTAINING FULL DETAILS OF THE TIME AND MONEY-SAVING FEATURES OF THIS NEW INSTRUMENT

THE G-E TIME SWITCH FOR CONTROLLING WATER-HEATER LOADS

SAVES ON MAINTENANCE


Weatherproof—can be mounted indoors or outdoors
Positive quick-make and quick-break silver contacts
Time dial, supplied cut to schedule, operates contacts simply and directly
Telechron synchronous motor assures long life and reliability

YOU can forget maintenance expense with a G-E Type T-11 time switch. It is timed and powered by the well-known Telechron motor, which has a proved record of reliability. Once set and connected, this switch will keep running without attention.

You also save on first cost, on installation cost, and on inventory.

Let us explain how the features of the T-11 switch make these savings possible. Details and prices are given in Bulletin GEA-1669, "Time Switches for Controlled Water Heating."

●

General Electric has also developed carrier-current equipment for the control of off-peak loads. Which method—time-switch or carrier-current—is best adapted for a particular set of conditions is thoroughly covered by two new G-E publications: GEA-2058, "How to Control Water-heater Loads" and GES-1106, "Revenue in Off-peak Loads Properly Controlled."

●

For copies of publications mentioned above, address the nearest G-E sales office, or General Electric, Dept. 6A-201, Schenectady, New York.

440-55

GENERAL ELECTRIC

World Water Power 5 per Cent Used

Notable progress was made in the utilization of the world's water-power resources even during the depression years. A tabulation of installed and potential horsepower in 107 countries, issued by the U. S. Geological Survey, shows that existing developments total about 55,000,000 hp., while the aggregate of potential power is 472,000,000 hp. The latter estimate is based on ordinary low water and an efficiency of 70 per cent in the plants. Since installations average two to three times the potential power at low flow at the same sites, ultimate developments in excess of 1,000,000,000 hp. are possible.

During the past four years the installed capacity increased by 20 per cent. It has approximately doubled since 1923.

Large resources, virtually undeveloped, exist in Central and in most South American countries. The vast potentialities of Asia remain almost untouched except in Japan, which has six-sevenths of all the installed horsepower in Asia. Africa has 40 per cent of the world's total potential water power, but very little of it has come under control.

World's Developed Water Power

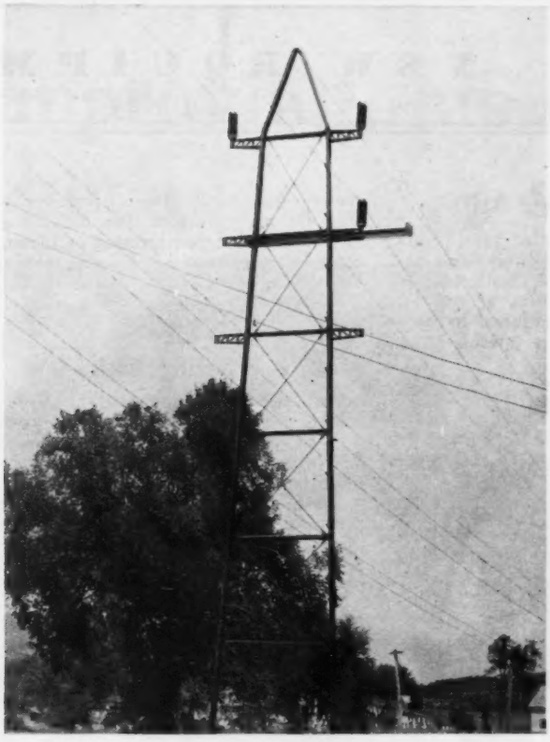
Year	Hp.	Year	Hp.
1920.....	23,000,000	1930.....	46,000,000
1923.....	29,000,000	1934.....	55,000,000
1926.....	33,000,000		

Summary by Continents

Continent	Developed	Potential
North America.....	24,400,000	73,000,000
South America.....	1,000,000	54,000,000
Europe.....	24,300,000	58,000,000
Asia.....	4,900,000	80,000,000
Africa.....	115,000	190,000,000
Oceanica.....	550,000	17,000,000
Approx. total.....	55,000,000	472,000,000

Water Horsepower in Leading Countries

Country	Developed	Potential
Canada.....	7,547,000	18,000,000
United States.....	16,075,000	42,000,000
Mexico.....	450,000	6,000,000
Brazil.....	700,000	25,000,000
Chile.....	114,000	2,500,000
Austria.....	900,000	1,660,000
British Isles.....	400,000	850,000
France.....	4,300,000	5,400,000
Germany.....	2,800,000	2,000,000
Italy.....	5,800,000	3,800,000
Norway.....	2,400,000	12,000,000
Spain.....	1,400,000	4,000,000
Sweden.....	1,800,000	5,000,000
Switzerland.....	2,350,000	2,500,000
Soviet Russia.....	1,000,000	8,425,000
India.....	410,000	27,000,000
Japan.....	4,200,000	8,600,000
Belgian Congo and Mandate.....	70,000	90,000,000
Australia.....	37,000	600,000
New Zealand.....	300,000	2,500,000



Showing the effect of a 2000 ampere, 40 cycle duration, arcover on a Lapp Line Post. Insulator sound electrically and mechanically. All of 15 insulators similarly tested would have maintained service indefinitely.

Line Posts Solve Difficult Problems

Reinsulation of the above 66 Kv pin type line was necessary due to a bad lightning record and radio interference. The use of suspension insulators would have required rebuilding the entire top of the structures—at prohibitive cost.

Lapp Line Posts were used with every expectation realized. Radio interference complaints have been eliminated and the insulators withstand the inevitable lightning flashovers in a most gratifying manner.

Line Posts will save you money, no matter whether your problem is regular maintenance, reinsulation of troublesome lines or raising the operating voltage to handle the rapidly increasing loads.

Let us help find the answer to *your* problem. Write for Bulletin No. 112.

LAPP

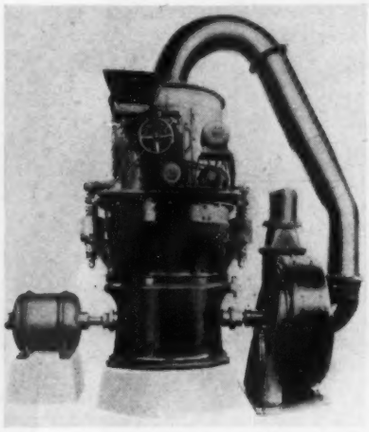
INSULATORS

LAPP INSULATOR CO. INC. LEROY·N.Y.·U.S.A.

NEW EQUIPMENT

Bowl Type Grinding Mill

This coal pulverizing mill for steam plants, although applicable to both direct firing and storage systems, is said to be ideally adapted to direct firing, since it runs at constant speed, the output being controlled by varying the rate of feed with a variable transmission on the automatic feeder. A revolving bowl or grinding chamber is the unique feature of the mill. Coal, after passing between the reduction rolls and grinding ring, works its way up the walls of the bowl by centrifugal force. As the particles reach the rim, fine and intermediate sizes are picked up by air coming up from annular spaces around the bowl and carried into the separator above for further classification. Oversize particles drop back to go through again.



Constant speed electric motor drive; grinding pressure and clearance between rolls and bowl adjusted from outside while mill is running. **Combustion Engineering Co.,** New York.

•

Stroboscopic Tachometer

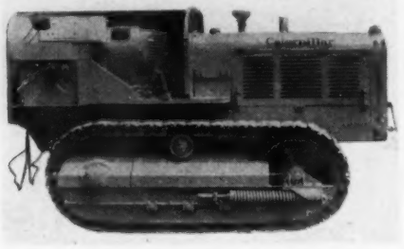
Accurate speed measurement without the necessity for mechanical contact with the machine under study is possible with this tachometer. Light from an alternating-current source is directed on the rotating or reciprocating machinery and the flash rate of the light adjusted until the machine appears to remain stationary. Direct readings taken from the scale provided then indicate speed of rotation. Lamp, triggering oscillator and controls are contained in a single case. Provision is also made for control at the line frequency or by external contactor.

"Strobotac" speed ranges, 600-4,000 r.p.m., 2,400-16,000 r.p.m.; consumes 25 watts on 60-cycle, 115-volt circuits; dimensions 6½x9x10 in. **General Radio Co.,** Cambridge A, Mass.

•

Mobile Welding Unit

This portable welding outfit, used for reaching welding jobs otherwise inaccessible, consists of a welding unit mounted on a mobile tractor. From the tractor engine flywheel back the platform has been redesigned to provide for mounting an inclosed welding generator and other welding equipment. Power for operating the generator is supplied through V-belt drive connected to a power take-off at the rear of the tractor. Compartments at the rear of the unit provide for reeling and storing welding cable and rods. The tractor drawbar is free for pulling jobs found along the right-of-way.



General Electric generator; rating, 300 amp., 40 volt, d.c.; "Caterpillar" twenty-eight tractor. **Caterpillar Tractor Co.,** Peoria, Ill.

•

Manual Voltage Regulator

This manual voltage regulator for use in laboratory experimentation, production testing and appliance servicing consists of an auto-transformer to which the primary line voltage is applied. A contact mounted on a traveling arm taps each turn of the winding, thereby supplying a secondary voltage suitable for testing. A full range voltmeter which indicates secondary output and a knob which provides manual control of the traveling arm and contact are mounted on the instrument face.

"Voltrol" provides stepless control from 0-130 volts; regulation accurate to within ½ volt. **Acme Electric & Manufacturing Co.,** Cleveland, Ohio.

Angle Clamp for Farm Lines

With this clamp, designed to simplify angle construction in farm line design, any angle ranging from 30 to 120 deg. can be turned without dead-ending the conductors and using jumpers. Special "U"-bolt practice, in the clamp design, permits this clamp to be attached directly to a 6-in. suspension unit, without use of intermediate fittings. This one clamp will fit 41 different types and sizes of conductors.

Clamp No. 80431, is 4 3/16 in. long; takes conductors up to No. 2/0 A.C.S.R. **Ohio Brass Co.,** Mansfield, Ohio.

•

Metallic Resistance Alloy

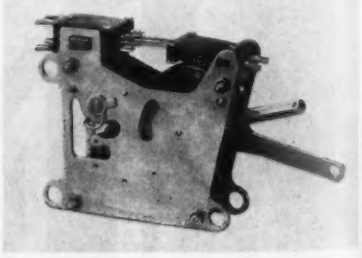
"Kanthal"—Three grades available for 2,462, 2,372 and 1,150 deg. F. operation. **C. O. Jelliff Mfg. Corp.,** Southport, Conn.

An electrical resistance alloy having an operating temperature above 2,460 deg. F. is available for use in the heating elements of domestic appliances and electric furnaces. Further application is found in its use for hearth plates, recuperators and pyrometer sheaths. Its high specific resistance (35 to 40 per cent above that for nickel-chrome alloys) makes its use in rheostats advantageous, while its resistance to the action of sulphur gases makes possible its use in the sulphur and iron pyrites industries.

•

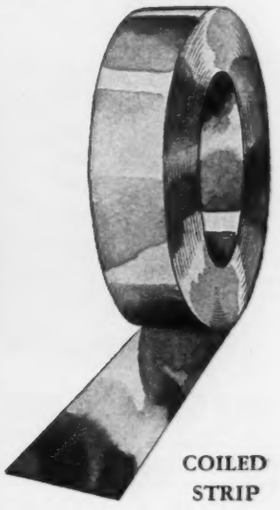
Automatic Timer

Provided with two levers, one for fixing the timing interval and the other for simultaneously closing the power switch and starting the timer, this device provides a means for regulating accurately the time that power is supplied to electrical equipment. A stock timing range of five minutes maximum is provided, though a nine-minute range can be obtained. The power switch is of the double-pole, double-throw type equipped with silver contacts.

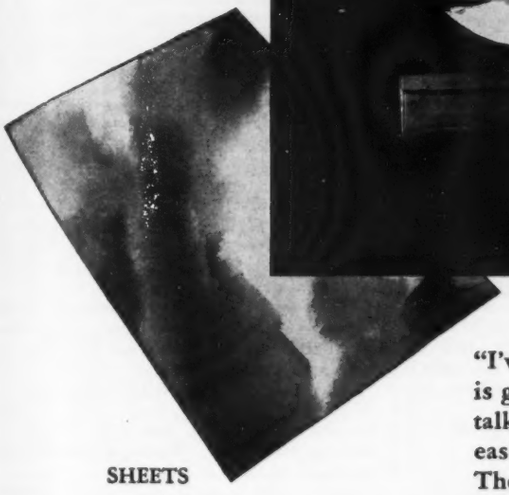


Type No. 59, 6-amp. capacity on 110 volts a.c. or d.c. **Walser Automatic Timer Co.,** New York City.

"I'm approving this change to SIL-CON because . . ."



COILED STRIP



SHEETS

"I've checked over all the figures, Chief, and I'm satisfied that Sil-con is going to save us money and give us better motor performance. I talked with the punch shop foreman, and he tells me that this steel is easier on dies, because it's uniform in temper and has no loose scale. The assembly floor likes it better, because it stacks flat and the laminations don't have burred edges. Then I took the test readings on the motors we made up, and they show better performance than any of our standard motors. And here's a funny thing, Chief, the fractional motors with the laminations made from the coiled strip show just as good performance as the larger ones where we used the sheets. We never had that happen before on any of the tests we made, so it must be a mighty uniform steel, and that's what we want when we have to give guarantees." • You, too, will approve the change to Sil-con if you give it a fair test. Write for complete data.

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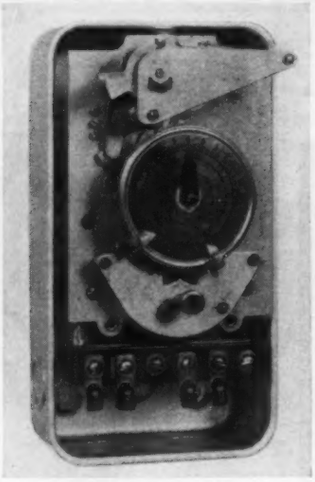
Republic Steel CORPORATION

GENERAL OFFICES · · · YOUNGSTOWN, OHIO

Automatic Time Switch

Suitable for general-purpose applications, such as store and show-window lighting, floodlighting, domestic water heaters, poultry house lighting, etc., this time switch will



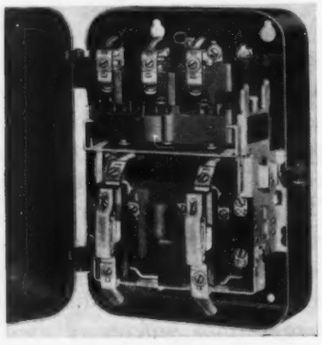
Type T-17; for 115 or 230 volts; current 40 amp. per contact; single, double and triple-pole, single-throw and single- and double-pole, double-throw switches available; also two-circuit switch with separate break. **General Electric Co.**, Schenectady, N. Y.

control most circuits on a schedule related to the time of day. It will perform any practical number of operations per day and can be set to skip one or more days if desired. The switch is operated by small riders clamped to the time dial at selected points. These riders engage the tripping lever operating the switch.

•

New Motor Starter

Features of this new across-the-line motor include a new temperature overload relay designed on the melting alloy principle. Improved accuracy for the relay is claimed



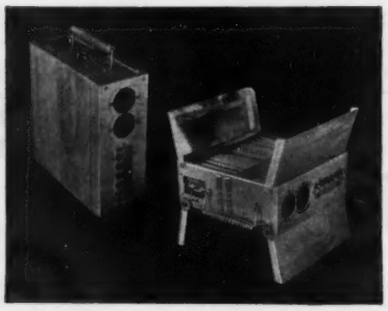
Type A-32; rated 25 hp., 440 and 550 volts; 15 hp. at 220 volts and 7½ hp. at 110 volts; furnished for remote push-button control. **Condit Electrical Mfg. Corp.**, Boston, Mass.

by inclosing it in a molded case. Other features are silver contacts, vertical make-and-break short-stroke mechanism and a multi-break arc-prevention principle. Undervoltage protection is also provided.

•

Resistance Load

Designed to meet the demand for a compact, non-inductive resistance load for testing either relays or watt-hour meters, this test load in kit form uses a new style of resistor which is said to combine compact form with light weight and long life.



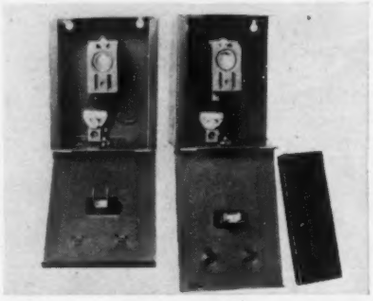
Capacity 30 amp., 120 volts; 15 amp., 240 volts; weight, 8½ lb.; dimensions, 9¼x4¼x10¼ in. **The States Co.**, Hartford, Conn.

Loading switches are provided to give current adjustment in small steps applicable to a wide testing range. Control switches are indented and surrounded by a protective barrier. Used for relay testing, a rheostat is mounted on one side of the case to provide smooth adjustment to full capacity.

•

Ganging Type Switch

These switches are provided with removable side walls which permit a number of the switches to be ganged together to conserve space. Individual units are joined by



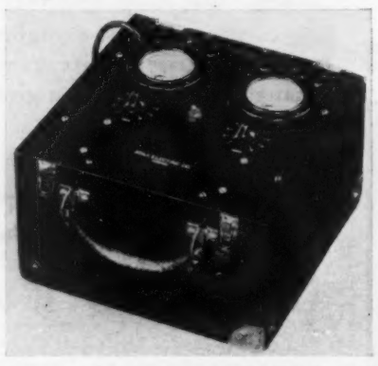
Available in three-pole arrangements, two- and three-wire solid neutral, and straight two-pole. **Square D Co.**, Detroit, Mich.

a connector which is inserted in place on the wall. Opening the door of the switch disconnects the circuit so that the fuses are dead when accessible.

•

Transformer Tester

Designed to replace footage charts for determining the load on luminous tube transformers, this kit consists of a voltmeter and ammeter mounted in a portable kit. It is said to provide an accurate check on the efficiency of operation of both transformer and sign.



Model 9512. **Sola Electric Co.**, Chicago.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

A data sheet covering the properties of nickel alloy cast irons is now available from the International Nickel Company, New York City. This 11-page publication deals with the metallurgy of cast irons and their applications in petroleum production equipment. Numerous photomicrographs, charts and tables are used to illustrate the text and give specific information on characteristics and properties.

Containing interior pictures, cutaway views, drawings, diagrams and a generous amount of text explaining operation and design, a booklet (CGA-35) published by the Hays Corporation, Michigan City, Ind., is devoted to discussion of indication and recording gages, featuring the pointer type for draft, pressure and temperature measurement.

Engineering features, construction details, specification tables and dimensions of new type rural line transformers are included in a 6-page bulletin of the Maloney Electric Company, St. Louis, Mo. It is designated as bulletin 35730.

"Service Hints" is the title of a 70-page booklet recently published by the Hygrade Sylvania Corporation, Emporium, Pa., to assist amateur and professional service men in locating radio trouble. Typical sources of trouble in a number of commercial sets are enumerated.

Construction features of a new line of polyphase motors for air-conditioning application are given in a recent bulletin of the Century Electric Company, St. Louis, Mo.

Essential engineering information on the application of electrical resistance thermometers to the regulation of an air-conditioning system is given in the 23-page bulletin No. 4001 of Leeds & Northrup Company, Philadelphia, Pa.

A 90-page handbook distributed by the National Electric Products Corporation, Pittsburgh, gives installation hints for surface and extension wiring with the use of "Metal Molding," "Metal Xtensionduct," "Florduct" and "Ovalduct." It is written for the man on the job and contains numerous drawings illustrating installation methods.

Two leaflets, one describing a new rural-line neutral support and the other a line of angle insulator pins, are available from the St. Louis Malleable Casting Company, St. Louis, Mo. Application, diagrams, and specification tables are included in each bulletin, together with a discussion of the design features.

Type "A" safety switches are the subject of a leaflet which outlines their engineering features and applications and which is available from Electric Controller & Manufacturing Company, Cleveland, Ohio.

"The Battery Industry at a Glance" is the title of a statistical bulletin published by the statistical committee of the National Battery Manufacturers Association, New York City. Complete figures on the storage battery industry over a long time period are given. Copies are 25 cents each.

"Vitrohm" pressed steel plate rheostats are the subject of 16-page bulletin No. 60, which gives information on the construction and design features, application, ratings and dimensions of these rheostats. Copies may be obtained from the Ward Leonard Electric Company, Mount Vernon, N. Y.

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Municipal Items

HOPKINTON, IOWA.—Plans for the construction of a municipal light and power plant are held in abeyance awaiting the final outcome of the city's application for a P.W.A. grant of 45 per cent of the $67,800 it has been estimated the project will cost. The city voted $67,800 bonds for this project some time ago (ELECTRICAL WORLD, August 17, page 101). The Iowa Electric Company serves the city.

WAUKON, IOWA.—Election is to be held October 3 on a proposal that the city finance the construction of a municipal light and power plant through an issue of $175,000 revenue bonds.

WISCONSIN—Approval has been given by the state Public Service Commission of the first municipal power district in Wisconsin, comprising seventeen towns and four villages in Polk and Burnett counties. The ruling interpreted for the first time the power district law enacted by the 1931 Legislature. Because seven of the 29 communities in the originally proposed district voted against the move the commission was required to approve or disapprove the feasibility of the smaller district (ELECTRICAL WORLD, September 14, page 103).

BESSEMER, ALA.—P.W.A. Administrator Ickes has tentatively approved a loan and grant totalling $1,238,182 for the construction of a power distribution system and interconnection with T.V.A. The application has been sent to W.P.A. Administrator Hopkins for his approval. Birmingham Electric Company has asked the District of Columbia Supreme Court to prevent P.W.A. from making the loan in a request for an injunction filed September 17.

TARRANT, ALA.—Loan and grant totalling $329,091 for the construction of power distribution system and interconnection with T.V.A. has been tentatively approved by Administrator Ickes and sent to Mr. Hopkins for his approval. Birmingham Electric Company has asked the District of Columbia Supreme Court to restrain P.W.A.

PARAGOULD, ARK.—B. M. Kitchens as a taxpayer has filed an appeal to the Arkansas State Supreme Court from an order of Chancellor J. F. Guatney dismissing his petition for an injunction to restrain the city from selling $100,000 in bonds for a municipal light and power plant. Mr. Kitchens maintains that sale of the bonds to the federal government was illegal because the city had not obtained authority from the state department of public utilities to build a light plant. He claims the sale of bonds and erection of the plant would cause an unlawful levy of tax on all property in Paragould. The city has just applied to the department of public utilities for a certificate of convenience and necessity to clear the way for the bond sale. Following the allocation of P.W.A. funds the Arkansas Utilities Company applied to the Supreme Court of the District of Columbia for an injunction to restrain P.W.A. (ELECTRICAL WORLD, September 14, page 56).

RUSSELL, KY.—Officials of the Kentucky and West Virginia Power Company have agreed to accept a ten-year franchise to furnish electricity. City Council recently authorized Mayor John Millis to ask the P.W.A. for a loan and grant of $50,000 for the purpose of building a municipal electric plant.

HUNTINGTON, IND.—City Council recently passed resolutions authorizing the Board of Public Works to apply to the P.W.A. for loans and grants to finance the construction of a municipal electric light plant and distribution system, cost $1,045,500, and a city power plant, cost $152,140. Action on the electric light plant project is contingent on the outcome of the city's appeal from the permanent injunction obtained against the proposal by the Northern Indiana Power Company.

BILOXI, MISS.—City has submitted tentative plans for establishment of a municipal power plant. The application was made by A. G. Adler, Birmingham, in behalf of the city for a loan, which will total approximately $600,000.

MONETT, MO.—Application has again been made to the P.W.A. headquarters at St. Louis for a grant of $65,342 to be used for the installation of a Diesel engine generating unit and construction of a municipal light and power plant. A prior application for P.W.A. funds failed to get approval (ELECTRICAL WORLD, September 14, page 56).

THAYER, MO.—Plans have been made for a municipal light and power plant to cost $72,750. Mayor C. A. Reef has filed an application for a P.W.A. grant of $32,737 and a loan of $40,012 to finance the project. If this application is approved the city contemplates issuing general obligation bonds to cover the loan.

ALBANY, N. Y.—The New York State Court of Appeals has decided that the act of the Legislature of 1935 creating the Albany light, heat and power authority is not unconstitutional, but that money to repay any of the $10,000,000 bond issue authorized in the act must be raised by taxes assessed against the property benefited and not against the county generally. Chief Justice Frederick E. Crane who wrote the opinion said: "In so far, therefore, as this act authorizes the county to issue bonds which would become a charge upon the property by reason of taxation within the towns of Berne, Knox, Rensselaerville and Westerlo, it is unconstitutional." The opinion pointed out, however, that the unconstitutional portions of the act may be eliminated.

STANBERRY, MO.—Application has been filed for a P.W.A. grant of $32,500 for a municipal light and power plant estimated to cost $71,607.

EAST LIVERPOOL, OHIO.—City officials have filed an application for a $1,500,000 P.W.A. grant to build a municipally owned electric power system. The plan calls for a 45 per cent grant and a 55 per cent loan.

CONNEAUT, OHIO.—City Council has authorized its project committee to apply to the P.W.A. for an outright grant of $309,600 and a loan of $378,400 to finance a $248,000 electric light plant and distribution system and a $440,000 gas manufacturing system.

CHATTANOOGA, TENN.—Plans for the Electric Power Board to construct a municipal distribution system were a step nearer realization when State P.W.A. Administrator Kenneth Markwell announced that he had forwarded the board's request for P.W.A. funds to Washington. Application was for a $6,000,000 loan and grant. Application for P.W.A. funds means that the city will build a system to compete with the Tennessee Electric Power Company or will make an agreement with the utility for sale to the city of the existing distribution system.

ELECTRA, TEX.—City will hold an election on October 1 for the purpose of voting on the question of issuing $75,000 power plant construction bonds.

ROCKWALL, TEX.—Application has been made to the P.W.A. for the allocation of a $50,000 loan and grant for the purpose of erecting a municipal light plant. The 55 per cent loan is expected to be repaid from service charges.

Recent Rate Changes

Utica Gas & Electric Company has been granted special permission by the New York Public Service Commission to file revised rate schedules which will afford consumers in its territory a substantial reduction in charges for electricity. The purpose of the new filing is to put into effect the so-called "inducement" plan under which residential consumers who use energy above a minimum base of 10 kw.-hr. per month will receive certain benefits from their increased consumption. The company's filing is in two parts, covering city and rural territory.

•

Rochester Gas & Electric Corporation at a hearing held recently before the New York Public Service Commission proposed a reduction in electric rates for 110,000 consumers, amounting to $339,000 a year. In return the utility wants the commission to drop its current probe into the fairness of the company's rate schedule. All domestic electric consumers are affected. Pointing out that the probe which opened January 21 has already cost the company a substantial sum, with indications that the expense will continue for some time, T. Carl Nixon, counsel for the utility, stated that the "company would rather give the consumers the benefit of a reduction, even though the effect is to reduce its income below what it considers a fair return, than to continue indefinitely to bear an expense out of all proportion to the ultimate to be gained by anybody." In addition to the cut for domestic electric users, the company will revise its schedules for service in rural communities, reducing the minimum charge on many of its rural lines. Consideration will also be given possible revision in other classes of service, Mr. Nixon said.

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Massachusetts Department of Public Utilities has agreed to undertake a study of the department's records of the public utility industry in this state on which to base any conclusions or findings of fact in connection with the study of the proposed sliding scale method of rates for Massachusetts. To this end the utilities commission has designated its chief accountant and chief engineer to supervise the work, which will be done by means of a W.P.A. allotment of funds. A series of public hearings will be held before the Governor's special sliding scale committee. A number of conferences have been held with public utility executives and the committee reports that marked willingness to co-operate has been displayed by spokesmen for the companies.

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New York Power & Light Corporation's commercial and industrial rates in the Albany, Troy, Schenectady and Cohoes districts of the company will be investigated by the State Public Service Commission of New York. The commission has announced that an investigation has been instituted. Revisions of the commercial and industrial rates in some of the company's territory were recently made.

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Arizona Edison Company has cut its power rates in the towns of Florence, Casa Grande, Coolidge, Bisbee and Douglas, the new rates having gone into effect Sept. 1.

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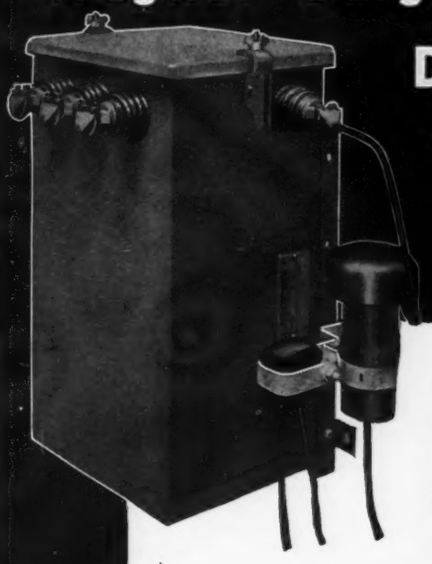
Washington State Department of Public Service has petitioned the State Supreme Court for a rehearing on the utility investigation cost cases which deprived the department of $250,000 operating revenue. The court last month held in favor of five public utilities which challenged the department's right to assess its investigation costs against them.

Wagner Surge-Protected Distribution Transformers



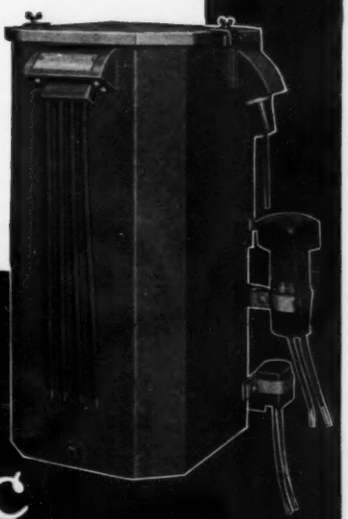
Wagner Surge-Protected Distribution Transformers have these advantages:

1. Prevents fuse outages due to lightning surges—permits higher standards and continuity of service.
2. Self-protected against surge-voltages such as produced by lightning.
3. Externally-mounted surge-protecting equipment (valve-type lightning arrestors and isolating gaps)—permits connecting the protective equipment in any desired combination.

In addition, these transformers embody the same design and construction features of other standard Wagner transformers.

Wagner Surge-Protected Distribution Transformers are available in both the stud-bushing-type and the conventional lead-type, in 2400 and 4800 volt, single-phase distribution classes. The stud-bushing-type surge-protected transformers (illustrated above) are preferable because doubly-protected against lightning, for in addition to the surge-protecting equipment, they have coordinated bushings in which the flashover takes place outside the tank, thus eliminating any flashover within the tank.

Write the nearest Wagner branch for further information regarding these transformers.



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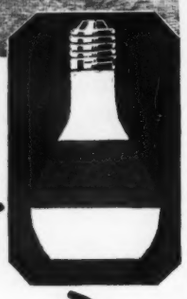

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SALES OPPORTUNITIES IN NEW CONSTRUCTION

RICHMOND, VA.—Virginia Electric & Power Company plans new addition to main generating plant on Twelfth Street, including installation of 12,500-kw. turbo-generator unit and accessories, high-pressure boilers, stokers and auxiliary equipment. Proposed to begin work in about 90 days. Cost close to $2,000,000.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, Knoxville, will receive bids until October 10 for one gasoline-electric generating unit for standby service at Wheeler hydro-electric power plant.

CHICAGO, ILL.—Continental Can Company, New York, N. Y., plans installation of motors and controls, conveyors, electric hoists and other equipment in new three-story addition to can manufacturing plant at Chicago. Cost close to $800,000.

SEATTLE, WASH.—Has plans under way for Ruby power dam and power plant, transmission lines and other construction for expansion in city-owned electric power facilities, estimated to cost $13,500,000. Project will include dam construction to cost over $8,000,000; new transmission line from Gorge power plant at Skagit to South substation, Seattle, $2,500,000, using fabricated steel towers; new South substation, $1,175,000; new North substation, $467,000; steam-electric generating station for auxiliary service, $14,740; steel tower transmission lines for tie-in service, $243,000. Financing is being arranged through Federal aid.

PARIS, TENN.—Has authorized surveys and estimates of cost for complete electrical distribution system, including power substation facilities. Election will be arranged soon to vote bonds in necessary amount. J. S. Watkins, Citizens' Bank Building, Lexington, Ky., is consulting engineer.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, Washington, will receive bids until October 7 for fourteen transformers, two distribution type transformers, 200 electric lighting fixtures, quantity of wire, fuses and other electrical supplies (Schedule 3092).

BROWNSVILLE, TENN.—Board of Haywood County Commissioners plans rural electrification project in different parts of county, including transmission and distributing lines, power substations and service facilities. Fund of $560,000 is being arranged through Federal aid.

BLACKWELL, OKLA.—Plans new city-owned electric light and power plant, including electrical distribution system. Cost about $800,000. Financing is being concluded through Federal aid. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

LAS VEGAS, NEV.—Nevada-California Power Company, Riverside, Calif., has authorized construction of new 6,600-volt transmission line to Weepah, Nev., about 7 miles, for service at properties of Weepah Nevada Mining Company. Cost about $20,000. Construction will be in charge of Arthur Cox, Las Vegas.

WARREN, OHIO—Republic Steel Corporation, Youngstown, Ohio, will make extensions and improvements in steel sheet and tinplate mills at Warren, with installation of new equipment. Cost about $1,000,000. Program will be carried out during next ninety days.

WEST ALLIS, WIS.—Has plans for new ornamental street-lighting system on main thoroughfares. Cost $180,000. Financing is being carried out through Federal aid.

MONTGOMERY, ALA. — Montgomery-Elmore-Autauga Power Association, Inc., Montgomery, recently organized, has approval of State Rural Electrification Authority for construction of about 165 miles of transmission and distribution lines in rural districts of Montgomery, Elmore and Autauga Counties for light and power service. Cost about $159,000. Work scheduled to begin soon.

FLINT, MICH.—Fisher Body Division, General Motors Corporation, plans installation of motors and controls, conveyors, electric hoists and other equipment in new addition to local automobile body plant. Cost about $450,000.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, Washington, receives bids until October 4 for quantity of insulated electric cable for arc welding for Mare Island, Calif., Navy Yard (Schedule 6030); until October 8 for 64 floodlights and spare parts for Eastern and Western Navy Yards (Schedule 6018).

MARSHALL, MO.—Plans extensions and improvements in city-owned electric power plant, including installation of new prime movers and auxiliary equipment. Cost $235,800. Financing is being carried out through federal aid. Henrici-Lowry Engineering Company, 114 West Tenth Street, Kansas City, Mo., is consulting engineer.

AIKEN, S. C.—Board of Aiken County Commissioners plans hydro-electric power plant on South Edistor River, including transmission line to city limits, where power substation will be located, and distribution lines to different parts of county. Cost estimated at $1,700,600. Application has been made for Federal grant and loan in that amount.

CLIMAX, COLO.—Climax Molybdenum Company, Pittsburgh, Pa., plans installation of heavy duty motors and controls, electric hoists, loaders and other equipment for expansion at mining properties at Climax, to increase capacity from 5,000 to 6,000 tons crude ore daily. Cost about $300,000.

ST. PAUL, MINN.—United States Engineer Office, St. Paul, will receive bids until October 10 for lighting system at lock and dam No. 8, Mississippi River, including lock lighting system transformers and regulators, incoming line transformer installation, switchboard, remote control switch cabinets, incoming power line, dam conduit system, lock grounding system, power feeders and connections, lock lighting system installation, navigation lighting system, service bridge lighting system, gasoline-electric standby power units, electric tow-haulage units, central control station service, portable lighing units, storage yard lighting system, hand-operated traveling bridge crane, etc. (Circular 53).

WHARTON, TEX.—Plans new city-owned electric light and power plant, and electrical distribution system. Cost about $250,000. Financing in that amount is being arranged through federal aid. Proposed to begin work during fall.

ST. LOUIS, MO.—Laclede Power & Light Company contemplates new addition to main steam-electric generating station on Mound Street, including improvements in present plant and installation of two new 15,000-kw. turbo-generators and accessory equipment. Cost close to $1,700,000. Management & Engineering Corporation, 327 South LaSalle Street, Chicago, Ill., is engineer.

TRINIDAD, TEX.—Lone Star Gas Company, Dallas, Tex., plans installation of motors and controls, air compressors, pumping machinery and other equipment in new gasoline refinery in vicinity of Trinidad, where tract of 30 acres of land has been secured. Cost close to $200,000.

Business Development Group Reports Progress

At a meeting of the N.E.M.A. Business Development Committee held recently C. E. Swartzbaugh, chairman, reported on the progress that had been made in carrying out the program of general business development approved by the N.E.M.A. membership and the board of governors at the spring meeting. The meeting, which was intensely interesting and productive, evidenced not only the material progress already achieved, but even more so the tremendous opportunities available and a determination to take every advantage of those opportunities.

The report stated that the N.E.M.A. staff has already available a preliminary specification for use in promoting adequate wiring. This has been utilized quite effectively by a group of inspectors in North Carolina. N.E.M.A. has also been approached by the inspectors in Connecticut asking that they may be permitted to make use of this document and for N.E.M.A.'s assistance in promoting an adequate wiring plan, which it is hoped will be made a state-wide operation. The association has also worked with Federal Housing Administration and the Rural Electrification Administration on adequate wiring.

Approval has been given, the report disclosed, for the addition of a man to the staff to contact architects with a view to assuring more complete electrification of homes, stores, office buildings, etc.

The report announced that after consideration of the most effective means by which N.E.M.A. might assist the local Electrical League movement, it was decided that the association could best serve by assisting in the reorganization of the League Council if that were the expressed desire of the leagues; act as the clearing house of league information and provide certain secretarial assistance.

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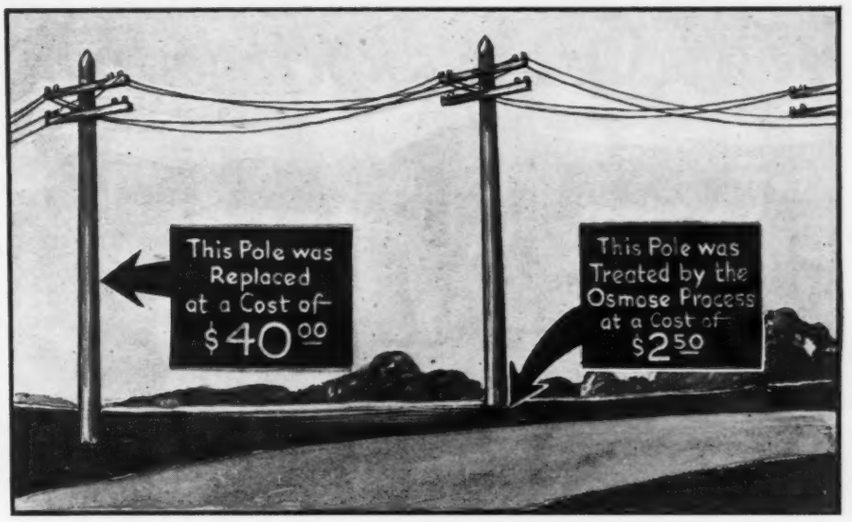
254 Air-Conditioning Units Installed in Chicago

Statistics compiled by the Commonwealth Edison Company show that in Chicago there were 254 air-conditioning installations made in the first seven months of this year, bringing the grand total for the city to 878. These installations range from air conditioning of homes and apartments to offices and industrial establishments, with theaters and restaurants accounting for a large part of them. The amount of business involved in the 254 installations was approximately $1,300,000. The supplying of power to run Chicago's 878 air-conditioning installations is adding approximately $500,000 to the annual revenues of the Commonwealth Edison Company.



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Westinghouse E. & M. Co., E. Pittsburgh, Pa

ALLOYS, COPPER
Mallory & Co., P. R., Indianapolis, Ind.

AMMETER, CLIP-ON
Columbia Elec. Mfg. Co., Cleveland, Ohio
Ferranti, Inc., New York, N. Y.

ANALYSES, REVENUE
Recording & Statistical Corp., New York, N. Y.

ANCHORS, GUY
Chance Company, Centralia, Mo.
Everstick Anchor Co., Fairfield, Iowa.
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.
Line Material Co., South Milwaukee, Wis.

APPLIANCES, HEATING
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York, N. Y.

BATTERIES, STORAGE, ALL APPLICATIONS
Electric Storage Battery Co., Phila., Pa.
Gould Storage Battery Co., Depew, N. Y.
Philadelphia Storage Battery Co., Phila., Pa

BATTERIES, STORAGE, AUTOMOTIVE
Firestone Tire & Rubber Co., Akron, Ohio.
Philadelphia Storage Battery Co., Phila., Pa.

BATTERY CHARGING APPARATUS
General Electric Co., Schenectady, N. Y.

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Davis Emergency Eqpt. Co., New York, N. Y.

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BLOCKS, METER TEST
States Company, Hartford, Conn.

BOILERS, STEAM
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.

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G & W Elec. Specialty Co., Chicago, Ill.
General Electric Co., Bridgeport, Conn.

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BRACKETS & WIREHOLDERS, INSULATED
Hubbard & Co., Pittsburgh, Pa.

BRUSHES, CARBON
Morganite Brush Co., Long Island City, N. Y.
National Carbon Co., Cleveland, Ohio.

BURNERS, OIL, GAS, PULVERIZED FUEL
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.

BUS BAR SUPPORTS
Burndy Engineering Co., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Pacific Elec. Mfg. Corp., San Francisco, Cal.
Schweitzer & Conrad, Inc., Chicago, Ill.

BUS BARS & TUBES
American Brass Co., Waterbury, Conn.

CABLE, ALUMINUM
Aluminum Co. of America, Pittsburgh, Pa.
General Cable Corp., New York, N. Y.

CABLE, NETWORK
Anaconda Wire & Cable Co., New York, N. Y.
American Steel & Wire Co., Chicago, Ill.
Rockbestos Products Corp., New Haven, Conn.

CABLE, PAPER INSULATED
American Elec'l Works, Phillipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite-Callender Cable Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York.
Roebling's Sons Co., J. A., Trenton, N. J.

CABLE, PARKWAY
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Okonite Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, STEEL STRAND
American Steel & Wire Co., Chicago, Ill.
Indiana Steel & Wire Co., Muncie, Ind.
Roebling's Sons Co., J. A., Trenton, N. J.

CABLE, SUBMARINE
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Okonite Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, VARNISHED CAMBRIC
American Steel & Wire Co., Chicago, Ill.
American Elec'l Works, Phillipsdale, R. I.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite Co., Passaic, N. J.
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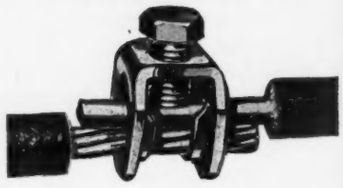

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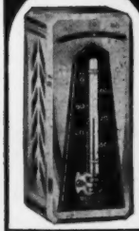

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